A PROCESS FOR VECTORING OFFENSIVE INFORMATION WARFARE AS A PRIMARY WEAPON OPTION WITHIN THE UNITED STATES AIR FORCE

THESIS

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Abstract

Consistently and comprehensively using Information Operations (IO) capabilities as a primary weapon option within the Air Force is the next step to operationalizing IO within the Air Force. Doctrine and official guidance have set the variables of mission and concepts of operations, organizational structure, and IW players in place. The missing variable to operationalizing IO and probably the most difficult is the "how" or process of the equation.

This research will introduce a useable process that can be incorporated within the Air Force for integrating offensive IW activities into the current and given environment. The process is the basis for further decomposition and identification of target aim points. In addition, it's use of effect points should aid in focusing long-range, deliberate, and crisis action planning on the possible desired effects on an adversary.

The research sets the stage by briefly defining the first three variables; organization, mission, and players in which AF IW is practiced and the inherent deliverables required. It will then introduce a view and decomposition of the information battlespace as the basis for offensive IW activities where affecting the information factors in order to induce a desired decision to achieve desired effects is the overall goal.

A PROCESS FOR VECTORING OFFENSIVE INFORMATION WARFARE, AS A PRIMARY WEAPON OPTION WITHIN THE AIR FORCE

1 Introduction

1.1 General Issues

The information environment, with it's inherit capabilities and vulnerabilities, has continued to grow into a complex system of people, hardware, software, processes, and information. This environment has the ability to process, store, and transport large amounts of information in a vast array of products and services and at speeds once unimaginable. The nation's dependency upon these capabilities has made the country and her assets vulnerable to potentially devastating attacks. This increasing importance to control information has become a necessity in conducting warfare in the 21st century. Air Force doctrine highlights this point:

> "...the possession and manipulation of information itself can be a key element of the war-winning equation. More than at any other time in history, information has evolved from being only an adjunct supporting primary weapon systems to, in many cases, being itself a weapon or target."
>
> AFDD 2-5, 1998: 1-2

The above quote also underscores the important need for IW to become "itself a weapon" to be used to deny, degrade, disrupt, or destroy an adversary's military organization through affecting the value of information, information

systems, and information based processes. This integration of full spectrum Information Operations (IO) must become a major focus of the Air Force's operational art (AFDD 2-5, 1998: 4).

1.2 Background

Currently there is a gap between Joint and Air Force doctrine and real world operations in the Air Force Information Operations (IO) arena. Steps in bridging this gap have been the finalization of guidance, definitions, and organizational structure as outlined in Joint Pub 3-13 Information Operations, AFDD 2-5 Information Operations, AF's Concept of Operation for Information Warfare (IW), the Intelligence Preparation of the Battlespace, as well as, the recent compilation of the IW Tactics, Techniques, and Procedures (TTPs). To solidify and lend credence to the guidance, definitions, and structure, the AF IO community must take the next step and employ a theory of operations suited for use within the operational and tactical level of operations. In order for the "IW weapon system" to move from its current supporting function to a primary weapon option, this theory of operations must be built upon striving to present offensive IW capabilities as a supported primary weapon option that is considered and utilized at every appropriate opportunity.

1.3 Problem Statement

AFDD 2-5 states, "IW capabilities should be considered and integrated into the overall theater campaign, not just as an add on—but as a primary capability the Air Force brings to the conflict" (AFDD 2-5, 1998: 32). However, a

missing link exists in the utilization of offensive IW as a primary weapon option. AF doctrine and official guidance has identified the variables of mission, organizational structure, and required personnel, but not the "how". The process equations, which translate the designs of doctrine into operational procedures that place offensive IW capabilities in full motion as a primary weapon option in our national arsenal, are currently undeveloped.

In order for IW to become a primary weapon option, in contrast to its current supporting role to kinetic and traditional forms of warfare, it's capabilities and effects must be presented and translated within the current and future potential battlespace. The critical question is,

"How can offensive IW be integrated within the AF as a primary weapon choice?"

This thesis attempts to address the question in two parts. First, this work applies a combination of techniques and steps drawn from business re-engineering, strategic management, and basic planning techniques, in order to identify and define the essential factors of a new and developing organization. These essential factors, mission, vision, goals, product(s), environment, and deliverables are outlined in Chapter 4. This identification is a key step in being able to transform an organization within one's current environment to a more prominent and beneficial setting.

A shortcoming of current doctrine is the limited guidance on "how" to "integrate" IO at all levels. The second part of this thesis is a proposed process developed with a focus upon the needs of its customers and the deliverables for

its users. A process that can be used within the current Air Force structure is developed for offensive IW.

In summary, this thesis identifies the necessary concepts and definitions to develop a useable, useful, and systematic process to produce the appropriate deliverables of target nominations, weaponeered targets, and effects assessment indicators for IW. All of these pieces can serve as the foundation for developing a baseline of knowledge needed for integrating offensive IW activities into the current Air Force planning and execution environment. While not the final answer in the transition of IW to a primary weapon choice at the operational level, it does provide a roadmap for the next steps in the journey.

1.4 Approach

Field observations, interviews, and a review of available literature, including but not limited to AF doctrine have been utilized to define the Air Force IO community, its organization, mission, and players. The qualitative research method of constant comparison, progressive analysis, clarification, and evolving conclusions was used to conduct data collection and continuous analysis. With the use of basic planning steps, strategic management techniques, and business re-engineering analysis, the targeting cycle environment was further broken down into customers and customer requirements, decision cycles and decision requirements, in order to determine the essential deliverables of the AF IW community.

Through the incorporation of several basic concepts concerning effects based operations, aerospace operations center (AOC) operations, target and combat assessment analysis, a systematic process has been developed presenting a theory of operations with the goal of presenting the capabilities of information warfare weapons as a supported weapon system. The concepts, definitions, and process will then be presented to a community of subject matter experts for their review and initial assessment for use by the IO community.

1.5 Overview

This thesis is structured in the following manner. Chapter Two presents a literature review of the key factors describing the different areas of study incorporated within the thesis; information operations, effects based operations, targeting and combat assessment concepts, information value and objective hierarchies. Chapter Three describes the methodology followed and evolving paths taken throughout the research process. Chapter Four provides the concepts resulting from the grounded, comparative analysis and the suggested IO planning process focused around the deliverables and customer needs of the IO planner. This portion of the work has also been tailored into a report for the Institute of Security Studies, the AF Research Laboratories—Human Effectiveness Branch, and the 23rd and 39th Information Operations Squadron. Chapter Five provides the analysis and findings of two assessment feedback activities performed. Chapter Six outlines overall conclusions, insights, and future research opportunities and recommendations. In addition, several

appendixes are included to support this research and to act as repositories of the presentation and collection instruments used. Appendix A outlines the additional research developed in an effort to validate the IW Weaponeering & Force Application phase of the developed process. In addition, pilot and preliminary study results, and a brief initial analysis of findings are included. Appendix B contains a table of the modified measures of effectiveness items and a summary of offensive action definitions that accompanies the IW Battlespace. Appendix C is used as a repository of the research instruments used during this study.

2 Literature Review

2.1 Introduction

Information Operations (IO) and its offensive component, Information Warfare (IW), have posed many challenges to the current operational and tactical environment of the Air Force. As suggested by several documents offering guidance in the integration of IO into the structure of the Air Force, it is essential for IO to be incorporated throughout the different levels of operations; strategic, operational, and tactical. This chapter provides an overview of the planning and targeting processes and defines the array of aspects that make up the key factors investigated within this research. These key factors are the different levels of operations, the Information Operations environment, the Aerospace Operations Center; effects based operations, targeting and combat assessment concepts, and the development of an environment assessment research model.

2.2 The Levels of Operations; Strategic, Operational, and Tactical

"Offensive IO may be conducted at all levels of war, inside and outside the traditional military battlespace" (JP 3-13, 1998:II-9). The boundaries between the different levels are not always distinct and one must always be sensitive to the effects of an IW action upon the other levels of war. Consideration of the effect should not be isolated to the level being planned (JP 3-13, 1998: I-2).

Table 2- 1 presents the definitions of the different levels of war or operations. It is included here to provide the reader with a reference of terms that will be used throughout this thesis.

Table 2- 1. Levels of Operations—Summary of Definitions

Levels of Operations	Definitions
Strategic Level of Operations	The level of war at which a nation, often as a member of a group of nations, determines national or multinational (alliances or coalition) security objectives and guidance, and develops and uses national resources to accomplish these objectives. Activities at this level establish national and multinational military objectives; sequence initiative; define limits and assess risks for the use of military and other instruments of national power; develop global plans or theater war plans to achieve these objectives; and provide military forces and other capabilities in accordance with strategic plans (JP 1-02, 1994: 439)
Operational Level of Operations	The level of war at which campaigns and major operations are planned, conducted, and sustained to accomplish strategic objectives within theaters or areas of operations. Activities at this level link tactics and strategy by establishing operational objectives needed to accomplish the strategic objectives, sequencing events to achieve the operational objective, initiating actions, and applying resources to bring about and sustain these events. These activities imply a broader dimension of time or space than do tactics; they ensure the logistic and administrative support of tactical forces, and provide the means by which tactical successes are exploited to achieve strategic objectives. (JP 1-02, 1994: 335)
Tactical Level of Operations	The level of war at which battles and engagements are planned and executed to accomplish military objectives assigned to tactical units or task forces. Activities at this level focus on the ordered arrangement and maneuver of combat elements in relation to each other and to the enemy to achieve combat objectives. (JP 1-02, 1994: 453)

2.3 Information Operations

Cornerstones of Information Warfare, released in 1995, was the Air Force's first public interpretation of Information Warfare. It led the refinement and growth of what is known as Information Operations. In addition to

"Cornerstones", the most notable Air Force guidance and documents for Information Operations are the AF Doctrine Document 2-5 Information Operations (AFDD 2-5) published in August 1998, and the USAF Concept of Operations for Information Warfare (CONOPS) released in December of 1999. These documents have redefined the concepts and definitions of IO and IW since the release of "Cornerstones" in 1995. These documents are used extensively as guidance to the IO environment, structure, and definitions.

2.3.1 The Structure and Definitions of Information Operations

AFDD 2-5 is a document that continues to build the stage for the growth and refinement of Information Operations within the Air Force. Written at the doctrine (highest) level of AF policymaking, AFDD 2-5 defines the two major elements of Information Operations; Information-in-Warfare and Information Warfare. Figure 2- 1, taken from AFDD 2-5 is the AF Information Superiority Construct and illustrates the concept of AF Information Operations in support of one of AF's core competencies, Information Superiority. This construct outlines the structure of the IO components within the AF and its essential and supporting role to achieving Information Superiority.

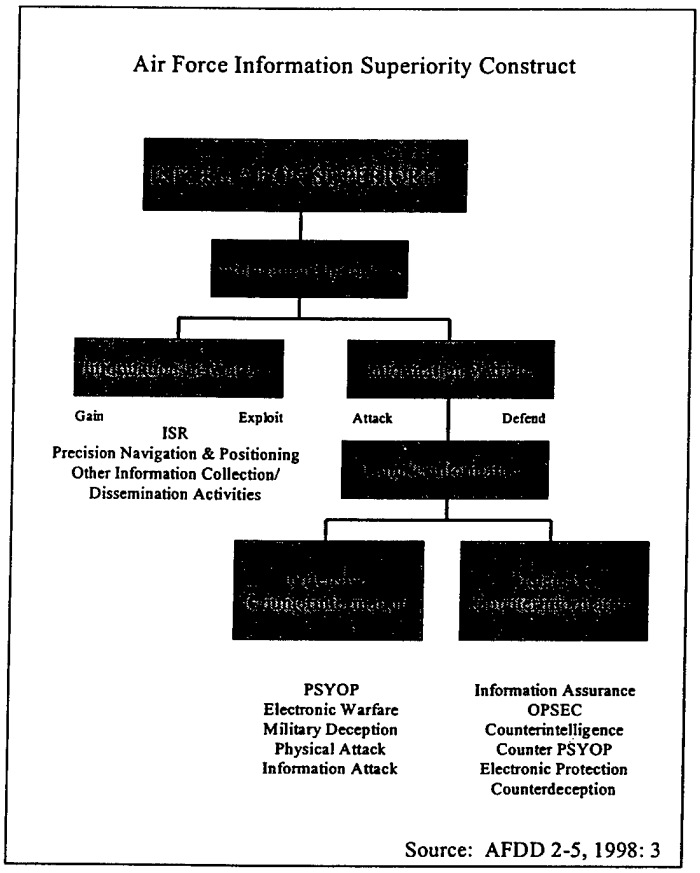


Figure 2- 1. AF Information Superiority Construct

Information Superiority is not a new concept, but has evolved into more than just an end state. Joint Vision 2020 extends the importance of Information Superiority as a vital support function in the obtainment of superior knowledge and decision superiority (JV 2020, 2000: 11). Table 2- 2 includes the definition of Information Superiority, as well, as other IO related terms. These terms are included here as a brief review and reference of the key terms within the information environment.

Table 2- 2. Key Terms within the Information Environment

Definitions of Information Related Terms	
Information Superiority (IS)	The capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same. (JP 1-02, 1994: 223) The ability to control and exploit information to our nation's advantage. (AF 2020, 2000: 5)
Information Operations (IO)	Those actions taken to affect an adversary's information and information systems while defending one's own information and information systems. (JP 1-02, 1994: 223) Those actions taken to gain, exploit, defend, or attack information and information systems and include both information-in-warfare and information warfare. (AFDD 2-5, 1998: 41)
Information-In-Warfare (IIW) (Gain and Exploit)	Involves the AF's extensive capabilities to provide global awareness throughout the range of military operations based on integrated intelligence, surveillance and reconnaissance (ISR) assets; its information collection/dissemination activities; and its global navigation and position, weather, and communications capabilities. (AFDD 2-5, 1998: 41) Note: Joint Doctrine does not recognize the term IIW The information required to provide total battlespace awareness, superior battlespace knowledge, in order to achieve decision superiority. IIW includes information about the adversary, as well as oneself. (Proposed definition)
Information Warfare (Attack and Defend)	Information operations conducted during time of crises or conflict to achieve or promote specific objectives over a specific adversary or adversaries. (JP 1-02, 1994: 224) Information operations conducted to defend one's own information and information systems, or to attack and affect an adversary's information and information systems. (AFDD 2-5, 1998: 42)

Joint and AF doctrine are referenced and included in Table 2- 2 in order to highlight the differences that may exist between these two levels. One important distinction is that Information Operations, as viewed by the Air Force, is made up of two separate and distinct pillars; Information-In-Warfare and Information Warfare.

Information-In-Warfare (IIW). The definition in AFDD 2-5 (given in Table 2- 2) is unlike other definitions and seems to only describe the capabilities that provide IIW instead of stating an action or a specific capability. In an attempt to align the definition of IIW with the other terms within IO, the following is the proposed definition to be used within this research.

> IIW is the information required to provide total battlespace awareness, superior battlespace knowledge, in order to achieve decision superiority. IIW includes information about the adversary, as well as oneself.

Battlespace awareness and knowledge is obtained through the collection, organization, and analysis of information in which a relative and comprehensive view of the playing field(s) is developed. This comprehensive view would enable all combat planners of various weapon systems to be able to allocate their weapons' capabilities against the critical nodes of the adversary's organizational system. The ability to see a clear battlespace would lead to the ultimate goal of superior battlespace knowledge and decision superiority within the battlespace.

Information Warfare (IW). The key focus on IW is the elements of defend and attack. One of the key differences between the two elements of IW is that the defend side is always engaged (AFDD 2-5, 1998: 42). In addition, defensive

actions require everyone's total cooperation and diligence within the system in order to keep the system secure. The old adage applies, "A chain is as strong as its weakest link". The security of a system is only as strong as its weakest member. Offensive actions, however, can be executed by one or many, upon one or many, and with a varied objective, intensity, persistence, or time interval. It is important to ensure both elements of IW must be considered, integrated, and be accomplished in support of the other. Each element must be planned and executed in concert (AF CONOPS, 1999: 4).

The pillars of IO, IIW and IW, must be closely integrated with each other and with all aerospace functions; reach, power, awareness, and knowledge. One must remember that IW missions are the actions taken within the adversary or ones own battlespace that affects the shape of the battlespace. IIW, on the other hand, provides a relevant and evolving view of the shape of the battlespace. The emphasis on IO and the need for the integration of IO at the operational and tactical levels is key to the war-winning equation. IO must evolve from being only an adjunct supporting primary weapon systems, to being itself a weapon or target (AFDD 2-5, 1998: 2). A key battlespace of this century will be the information realm.

2.3.2 The Environment of AF IO

The release of USAF CONOPS for IW was the next step the AF took to describe "how" the Air Force employs IW into existing functions. It outlined the need for the AF efforts to focus on implementing IW capabilities through

warfighting component commands in support of joint warfighting commands (AFDD 2-5, 1998: 7). Another requirement is that "IW activities and operations must be integrated within the normal campaign planning and execution process" (AFDD 2-5, 1998: 7). The purpose of the CONOPS was to outline the mission, the organizational structure, and those with primary responsibilities for IO within the AF community. These elements are key to this thesis and are developed in the following sections.

The Mission of AF IO. The Air Force's vision and mission for IO is to establish and maintain information superiority over the adversary and to provide the best battlespace information to the right place—anywhere, anytime (AF CONOPS, 1999: iii). Offensive IW activities are conducted to control the information environment to acquire and maintain information superiority, therefore, enabling the accomplishment of theatre and mission objectives (AF CONOPS, 1999: 1). Coordination and synchronization of defensive and offensive actions are essential to incorporate full spectrum IO capabilities across the entire battlespace (AF CONOPS, 1999: 4).

Both Joint and Air Force doctrine and guidance consistently compliment each other in identifying the mission of IO as a means to acquiring information superiority and the need to integrate and operationalize IW activities within the appropriate service's organizational structure.

In light of the overall AF mission for IO, offensive IW actions focus on the manipulation (denial, disruption, and degradation) or destruction of information in order to support efforts to affect the desired strategic, operational, and tactical

objectives or effects. The mission to integrate IO, as stated in the AF CONOPS, is a difficult task that will require changes within the AF IO and IW organizational structure, its mission, its personnel, and its process. The primary focus of the tactical level is to deny, disrupt, destroy, or otherwise control an adversary's use of information (JP 3-13, 1998, II-11).

In addition, IW activities and operations must be integrated within the normal campaign planning and execution process, making the consideration and use of IW second nature (AFDD 2-5, 1998: 7). To fully exploit the potential power of IW, it *must* become a primary weapon system of consideration and use in the achievement of strategy and objectives at all levels of operations.

The Organizational Structure. The organizational structure of IO at the operational and tactical level of the USAF unfolded through the finalization of the Air Force Concept of Operations (CONOPS) for IW in December 1999. This structure was set by the incorporation of the IW flight embedment within selected MAJCOMS and Numbered Air Forces (NAF) across the world. These flights have become part of the NAF while in-garrison and are incorporated as specialty teams within the deployed Aerospace Operations Center (AOC) (AF CONOPS, 1999: 11). The structure, purpose, and mission of the AOC is the driving force on how IW activities can be incorporated into the Air Force as a primary weapon option. In this situation, the IW Flights are the primary "customers" of this research. In order to meet a customer's needs, one must understand the organizational structure of AF IO, and have insight into the AOC's structure and major processes. The next section provides this insight.

The Aerospace Operations Center (AOC). The AOC is the senior operations center of the Theater Air Control System (TACS) and the focal point for the Command and Control (C2) of air forces (AFI 13-1AOC, 1999: 10). It provides the facility and personnel to accomplish planning, directing, and coordinating theater air operations (AFI 13-1AOC, 1999: 10). The organization and processes of the AOC must be able to cover the entire range of responsibilities from campaign planning to daily Air Tasking Order (ATO) execution (AFI 13-1AOC, 1999: 16). In short, the responsibility of the AOC is to perform a complex set of processes. The AF instruction for operational procedures for the AOC describes the process as follows:

> "Daily planning for the employment of forces in combat is a complex process of integrating force capabilities and limitations against enemy vulnerabilities to achieve optimum results in an ever-changing tactical environment".
>
> AFI 13-1AOC3

The basic AOC organizational structure consists of a director and four divisions; strategy, combat plans, combat operations, and air mobility. The overall tasks of these divisions are described by the functions of the Aerospace Plan Development process.

The Aerospace Plan Development is the underlying process of the AOC and consists of four major functions (AFI 13-1AOC, 1999: 17). Each of these functions plays a critical role in the accomplishment of the AOC's mission. Table 2- 3 summaries each of these functions.

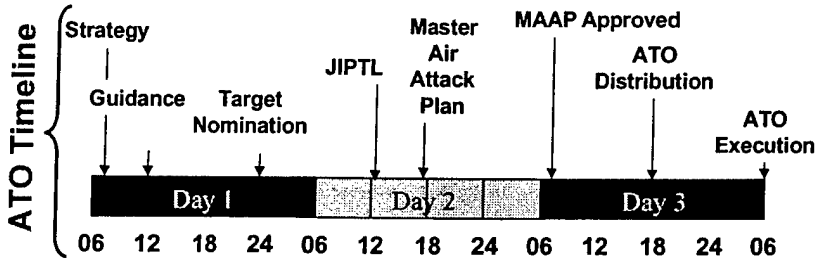
Table 2- 3. Description of AOC Functions

AOC Functions	Description
Aerospace Strategy Development and Articulation	This function incorporates many diverse subtasks to include theater campaign planning, preparation of the battlespace at the strategic and operational levels to planning considerations of target selection, mission execution and synchronization/timing, and weapon and resource availability.
ATO and ATO Production	The production of timely, coordinated, and executable air tasking and air control orders.
ATO Execution	The monitoring, executing, and adjusting of the operations for the current air tasking order.
Operational Assessment	The continuous evaluation of the results of operations based on desired effects to achieve desired objectives.

Source: AFI13-1AOC3, 1999; 17-22

Within the AOC there are a number of standardized processes used to synchronize the efforts of the Center across the divisions. The most prominent is the Air Tasking Order (ATO) cycle, which provides for the efficient and effective employment of joint air capabilities/forces made available (JP 3-56.1, 1994: IV-4). The ATO is the detailed plan for the application of air resources, which encompasses unit mission data, unit remarks, and special instructions. It is a critical, time-sensitive document that tasks and authorizes units in the application of air power resources.

Figure 2- 2 highlights the major milestones within the ATO cycle in its normal 72-hour sequential timeline.



Summary of the major milestones and products mapped across the 72 hour ATO cycle.

ATO--Air Tasking Order
MAAP--Master Air Attack Plan
JIPTL--Joint Integrated Priority Target List

Source: 8AF Blue Flag Briefing Slides, 2000

Figure 2- 2. Sequential depiction of the Joint ATO Cycle

Deeply intertwined within the ATO process is the targeting cycle. This process integrates requirements, capabilities, and efforts of all command levels. It is an analytical and systematic approach that matches available air assets, resources, and capabilities to threat vulnerabilities of target sets or aimpoints to accomplish objectives.

Figure 2- 3 is an illustration of the targeting cycle and the incorporation of the major products of the ATO cycle.

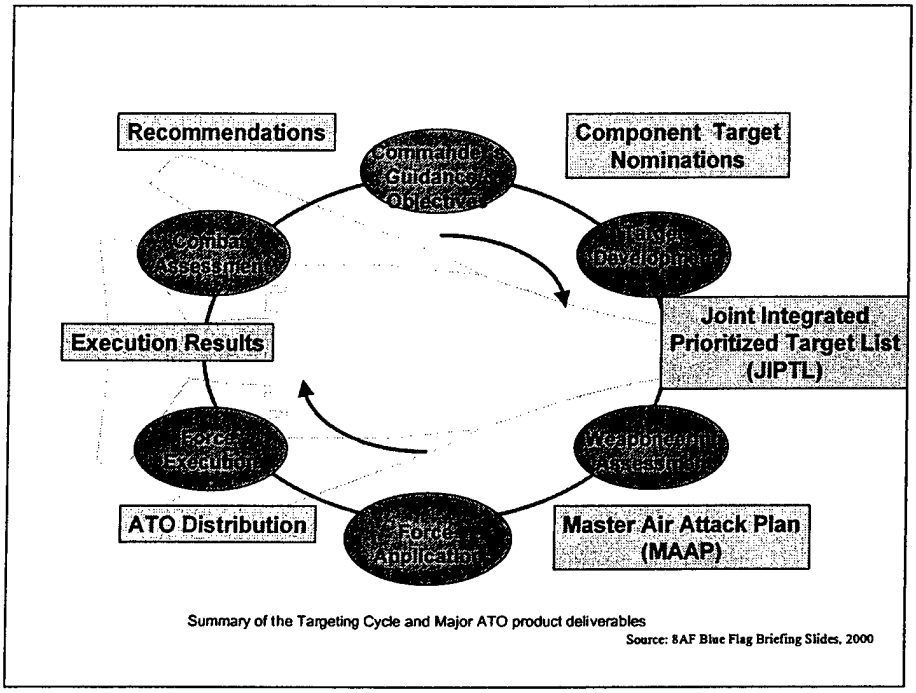


Figure 2- 3. Targeting Cycle and ATO Product Deliverables

Both the ATO and the targeting cycles work hand-in-hand to provide an efficient and effective means for planning, coordinating, allocating, and tasking air missions with the end result of meeting the stated strategy and objectives. Figure 2- 4 places each of the cycles side by side to illustrate how each compliment each other within the AOC environment.

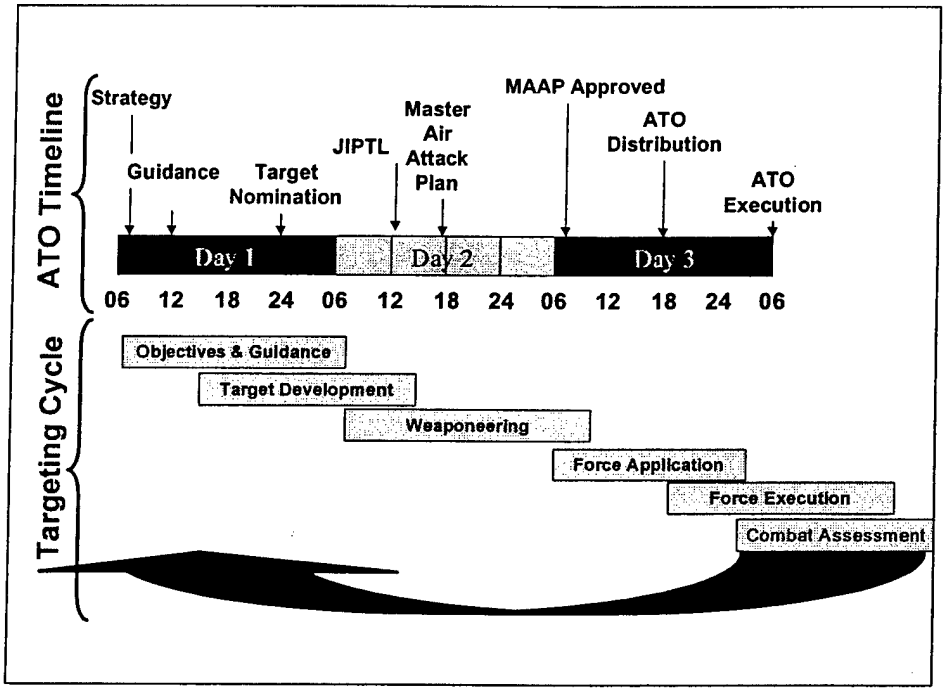


Figure 2- 4. Joint ATO and Targeting Cycles

Figures 2-2, 2-3, and 2-4 illustrate the AOC's organizational structure and processes that dictate timing and product requirements. In addition, to fully exploit the full spectrum of available weapons and capabilities, there are several deliverables that evolve from the targeting cycle that the IO planner must produce inputs to in order for the ATO to incorporate IO capabilities.

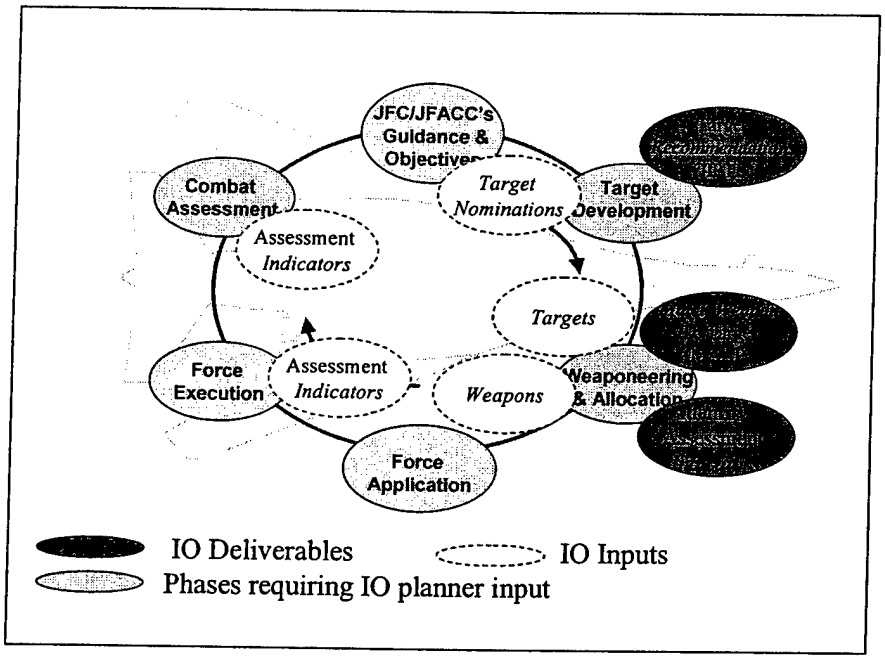


Figure 2- 5. IO Deliverables and Inputs

Figure 2- 5, highlights the phases requiring IO planner inputs, the specific inputs, and deliverables into the planning cycles of the AOC.

Manpower. To obtain the goal of information operations (attaining a degree of information superiority, which allows us to collect, control, exploit, and defend information without effective opposition) the Air Force has created teams of experts in the basic elements of IO; Information-In-Warfare (IIW) and IW (defensive and offensive) (AFDD 2-5, 1998: 2). These teams, termed IW Flights, are located within selected MAJCOMs and Numbered Air Forces. These IW Flights are intended to provide the command organization with operational IW planning and implementation capabilities within the Air Force (AF CONOPS, 1999: 11).

Each flight consist of a cross-functional team of experts in order to facilitate deliberate and crisis action planning and contingency execution across the full spectrum of offensive and defensive IW activities. During contingency operations, the flight is deployed as a specialty team within the AOC and represents the IW capability within all four divisions of the AOC; strategy, combat plans, combat operations, and air mobility (AF CONOPS, 1999: 11).

2.4 Effects Based Operations

The concept of effects based operations is paramount to the effective integration and use of offensive IW actions and weapons as a primary option. AFDD 2-5 states, "commanders must focus on the strategic, operational, and tactical effects desired in any particular situation and bring to bear the right mix of all capabilities to achieve those effects" (AFDD 2-5, 1998: 3). Effects based operations, as defined by a draft product titled *Concept of Operations for Effects Based Operations*, is an "approach to planning, executing, and assessing military operations upon on the desired effects of an action(s)" (EBO-Draft, 2001: 2).

> "Fundamental to AF's success is its ability to focus on the effects desired to achieve campaign objectives, at all levels of operations. It holds true for IO as for any other air and space capability". Planners should clearly define the desired effect, then identify the optimum capability for achieving that effect."
>
> AFDD 2-5, 1998: 27-28

Joint Vision 2010 and 2020's operational concept of Precision Engagement is effects based and relevant to all types of operations. The Air Force highlighted its importance by identifying it as an AF core competency. In addition, the AF IO community must also focus on accomplishing precision

engagement. "Precision engagement is the ability of forces to locate, surveil, discern, and track objectives or targets, select, organize, and use the correct systems; generate desired effects: assess results; and reengage with decisive speed and overwhelming operational tempo as required, throughout the full range of military operations". (JV2020, 2000: 28) A key to precision engagement is achieving an appropriate level of information superiority.

2.5 Targeting Cycle Concepts

The targeting cycle is a decision-planning framework used at both the joint and Air Force levels of planning and execution. As mentioned earlier, the targeting cycle, along with the ATO cycle, drives all planning functions within the AOC. It is a major, deeply engrained process that provides structure to a chaotic scene of activity. Due to the targeting cycle's extensive use within the AOC, the given environment that the IW Flights will operate, it is incorporated into this research in two capacities. First, the targeting and ATO cycles are used as a basis to analyze the environment and in determining the deliverables within this environment. Second, the targeting cycle is used as a guide for the proposed process focused on customer needs and the applicable deliverables.

Several other targeting concepts are also used to help in identifying the needed weapon characteristics of offensive IW actions. The concepts, target sets, delivery tactics, delivery platform, and payload also help to align offensive actions into more plausible, identifiable, and measurable units. The identification

of these important weapon characteristics helps to further decompose the IW action into "aerospace" terms as used within the Aerospace Operations Center.

2.5.1 Target, Target System, and Target Set

The target is the basic starting point of which many other targeting processes are based on. In its simplest form, "a target is a thing or place to be aimed at or hit" (AFP 14-210, 1998: 126). Several other definitions are described and used tending to a broaden scope of a target. The first states "a target that is a geographical area, complex, or installation planned for capture or destruction by military forces" (AFP 14-210, 1998: 127). Another useful definition borrowed from the intelligence community is that a target is a country, area, installation, agency, or person against which intelligence operations are directed (AFP 14-210, 1998: 127).

The target system is another important concept. The target system is defined by describing two similar, but distinct definitions. A target system includes all targets that are functionally related within a particular geographic area or any group of related targets that will produce a particular effect if destroyed (AFP 14-210, 1998: 18).

A target set was not formally defined within the targeting literature, but is used within the AF Concept of Operations for IW and within many informal discussions throughout the research. A definition was developed in order to reflect the meaning used by participants and researcher. The term "set" can be defined as "a group of persons or things classed or belonging together"

(Websters, 1991: 520). This definition for set was added to the simplest definition of target, a thing or place to be aimed at or hit. This combination yielded a description of a target set that describes its use in the CONOPS and discussions within the IO community. A target set is a group of persons or things belonging together that can give focus and aim for fulfilling specific command or mission objectives.

2.5.2 Tactic, Platform and Payload

Establishing weapon requirements and selecting the best available weapon requires knowledge about our weapon capabilities and limitations. This knowledge is not always straightforward and is often classified. Throughout the open literature, there is very little available that formally defined any type of weapon characteristics. The definitions used in this study are described below.

Tactics or Methods. Tactics and methods tend to be spoken interchangeably and seem to be readily accepted as a way of doing anything or a process. A definition of tactics was found and shows us a different view.

"Tactics is defined as the ordered arrangement and maneuver of units in relation to each other and/or the enemy in order to use their full potentialities" (JP1-02, 1994: 452). In order to consistently identify the "ordered arrangement and maneuvers" of an IW weapon system, when used within this research, tactics will describe, as a bare minimum, an effect point, the level of effect of deny, degrade, disrupt, and destroy, and the parameters to consider. Other specific considerations may also be incorporated.

Platform. Although referred to within the US Intelligence Targeting Guide, delivery platform is not specifically defined in the applicable literature. The definition used in this study is that a platform is the equipment, system, signal, or person used to transport the product or action to the intended target.

Payload or Munition. Munition has several meanings, dependent upon one's view of the battlespace. In its most restricted meaning, it is just another word for ordnance. With the above definition in mind and a focus on the IO planner, payload can be defined as the active agent or effect mechanism.

2.6 The Information Warfare Battlespace

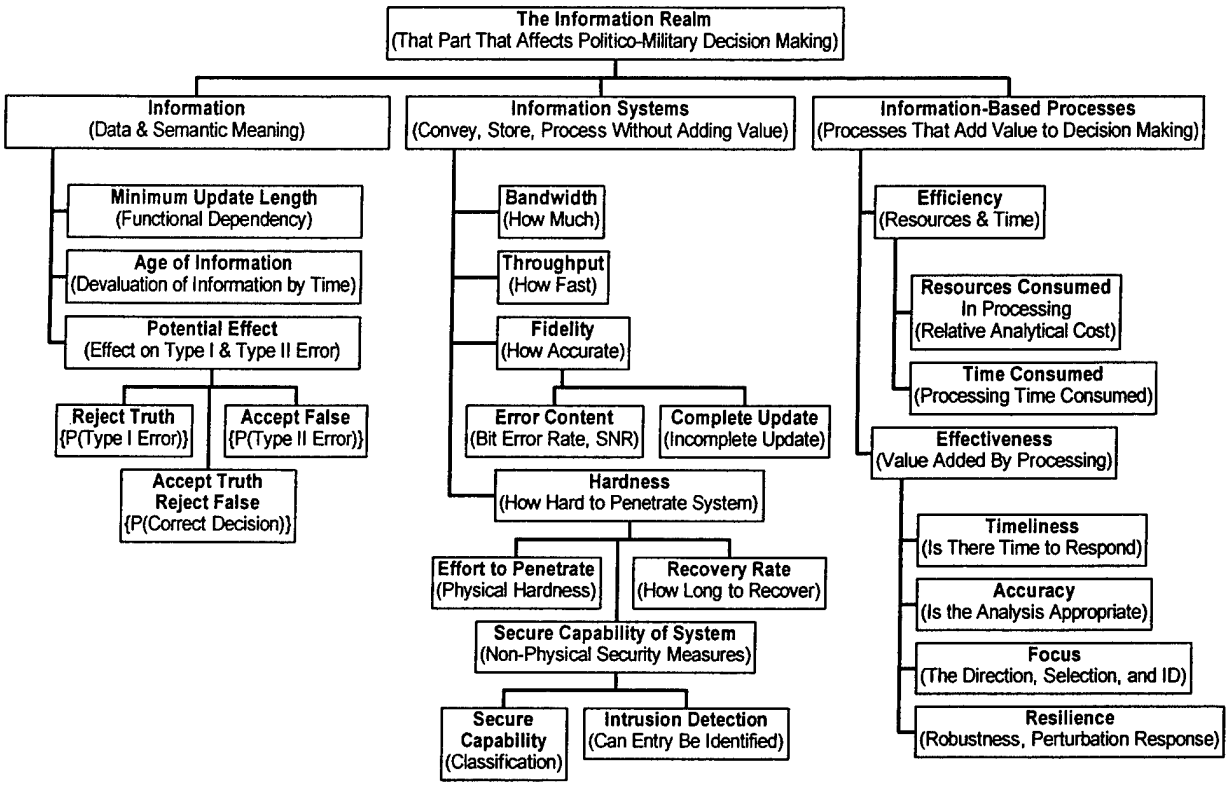
> A battlespace is defined as, "The commander's conceptual view of the area and factors, which he must understand to apply combat power, protect the force, and complete the mission. It encompasses all applicable aspects of air, sea, space, and information operations."
>
> AFDD 1 AF Basic Doctrine, 1997 (79)

Analysis of a battlespace can be described in four elements; aerospace, surface, information, and the human dimension. Three of the four elements can be further divided, respectively into sub-elements of air and space, land and sea, and data, systems, and functions (AF IPB, 1999: 5).

Since the release of AFDD 1 in 1997, there has been a further formalization and decomposition of a battlespace for information by the identification of components of information and information systems (AFDD 2-5, 1998: 2). In comparison, at the joint level, the battlespace is described as human factors, links, and nodes.

> The human factors are those affecting human decision processes. The links are the information and information systems used to support decision-making. The nodes are those information and information systems used to process information and implement decisions.
>
> JP3-13, 1998: II-13

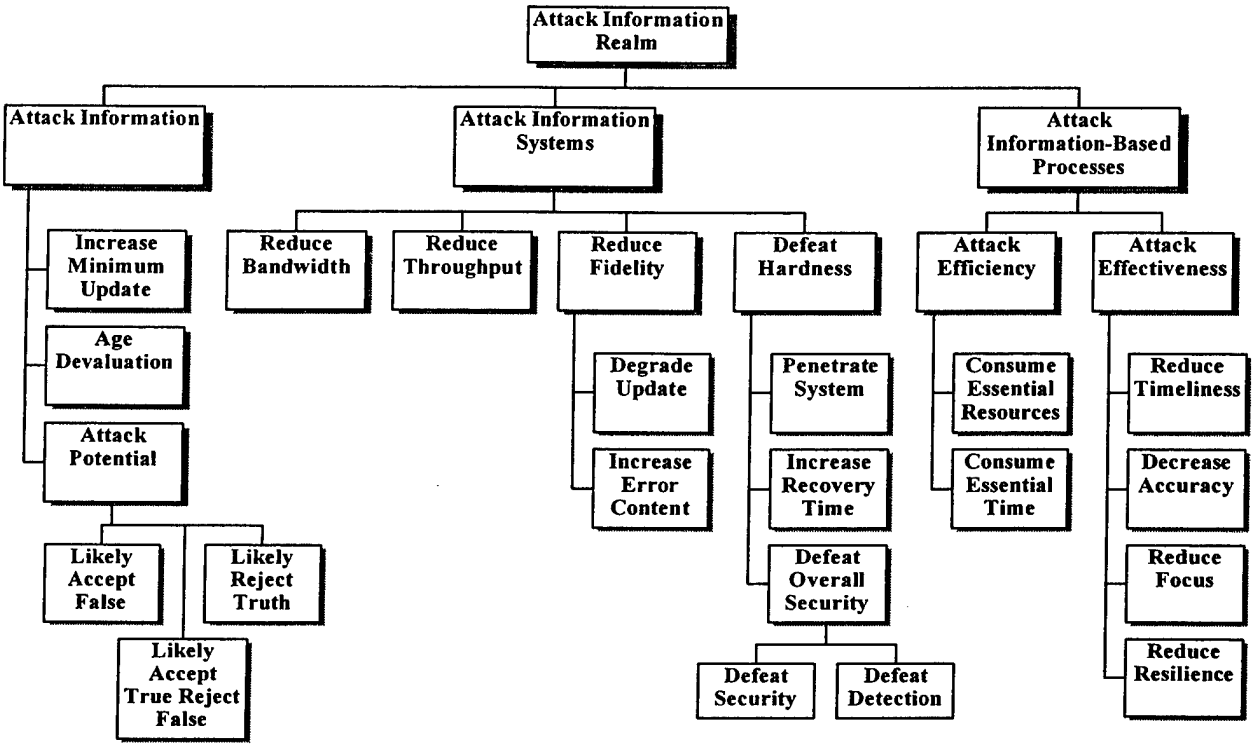
Another decomposition exists of the battlespace where individual attributes are quantifiable, operational, and understandable (Doyle, 1998: 31). This decomposition was first introduced by Capt Michael P. Doyle in 1998. He applied a Value Focused Thinking approach to the information realm, which was divided into information, information based processes, and information systems. Two hierarchies, Figure 2- 6 and Figure 2- 7, resulted from his study. They are called the Value Hierarchy for the Information Realm and Objective Hierarchy for Offensive IO, respectively. The value hierarchy decomposed the information realm to reflect the fundamental objectives and values of the decision maker (Doyle, 1998: 3-1).



Source: Capt Michael Doyle, AFIT Thesis, 1998

Figure 2- 6. Value Hierarchy for the Information Realm

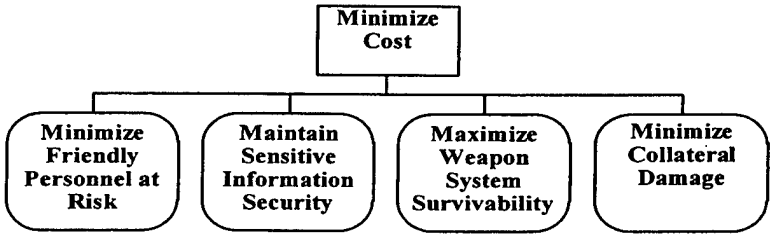
Applying the objectives of offensive IO to the value hierarchy developed the second product. The resulting hierarchy applied a consistent view of objectives of offensive actions, which attacked and removed value from these attributes. Figure 2- 7 represents the Objective Hierarchy of Offensive IO.



Source: Capt Michael Doyle, AFIT Thesis, 1998.

Figure 2- 7. Objective Hierarchy for Offensive IO

In addition to the attributes, the costs of employing an action must also be taken into account. This is represented below by Figure 2- 8.



Source: Capt Michael Doyle, AFIT Thesis, 1998.

Figure 2- 8. Cost Hierarchy for Offensive IO

Another aspect that makes these hierarchies valuable is the associated measures of effectiveness. Appropriate measures of effectiveness attributes

were developed for each attribute and costs. These were developed with IO and operational experts from the Joint Command and Control Warfare Center (now the Joint Information Operations Center) and US Special Forces Command. Each measure identifies a tangible measurement that can be used to assess an effect upon the identified and appropriate attribute.

Value Focused Thinking is a decision analysis approach that requires the decomposition of an environment to a consistent, non-repeatable, and operational level where actual single dimension measures can be determined and used. Capt Doyle's decomposition and resulting hierarchies and measures of effectiveness are presented as the basis for further refinement and the identification of the IW battlespace. The use of a modified objective hierarchy will be presented in Chapter 4 of this thesis. Modifications were made to accommodate a refocusing of the IO primary goal at the operational and tactical levels of operation.

2.7 Combat Assessment Concepts

"The time to begin thinking about assessment is before mission execution, not afterwards" (AFP 14-210, 1998: 67). Combat assessment is an on-going, dynamic feedback activity that evaluates combat operations effectiveness in achieving objectives. A comparison of the action's results to the objectives determines mission success or failure and drives current and future targeting decisions. This type of assessment is also required for offensive IW actions. There are three sub-assessment types used for traditional weapon systems

called Battle Damage Assessment (BDA), Mission Assessment (MA), and Munitions Effectiveness Assessment (MEA) (AFP 14-210, 1998: 30-31).

2.7.1 Battle Damage Assessment (BDA)

> "BDA is the timely and accurate estimate of damage resulting from the application of military force, either lethal or non lethal, against a predetermined objective. It can be applied to all types of weapon systems and through out the range of military operations."
> AFP 14-210, 1998: 71

To be effective, BDA must be tailored to the decision makers. The traditional BDA is further broken down into three lower level assessment types, Physical Damage, Functional Damage, and Target System Assessment.

Physical Damage Assessment. This assessment is a post attack, target analysis and estimation of the extent of physical damage to the target (AFP 14-210, 1998: 71).

Functional Damage. Functional damage takes into account and estimates the remaining functional or operational capability of an object or facility. This type of assessment is usually inferred from the assessments of physical damage. (AFP 14-210, 1998: 71)

Target System Assessment. A target system, as defined earlier includes all targets that are functionally related within a particular geographic area or any group of related targets that will produce a particular effect if destroyed (AFP 14-210, 1998: 18). A target system assessment is an estimation of the overall impact against the system (AFP 14-210, 1998: 72).

2.7.2 Mission Assessment (MA)

This type of assessment addresses the effectiveness of operations of a type of mission. For example, some of the types of missions are those of interdiction, counterair, or maritime support. Although assessment is usually concerned with the cumulative damage to targets, mission assessment is more concerned with the effectiveness of the overall mission upon enemy activities. "The mission is successful if the enemy is reacting as intended (AFP 14-210, 1998: 75).

2.7.3 Munitions Effectiveness Assessment (MEA)

Munitions Effectiveness Assessment is concerned with both munitions data and platform delivery conditions. It is a performance-based assessment that compares the expected performance to the actual performance (AFP 14-210, 1998: 74).

2.8 The Operational Environment Assessment Model

A model was built to accommodate the key factors and constraints identified during an initial environment assessment. The model is a combination of several different techniques common in business management. The approach combines an overall customer oriented and process focus from business re-engineering, the identification of the research object's characteristics of mission and its surrounding environment is incorporated from strategic management, and guidelines to identify tangible deliverables and activities are included from basic planning steps.

The overall model encompasses a focus on the customer and process. For example, the research would always revert to focusing on a process and attempting to determine what inputs were needed in order to achieve the desired outputs that were required or had value to the customer (Hammer, 1993: 35).

In order to understand the current state of the IO planner's organization, three key components were included within the model to ensure a comprehensive exploration. The first two components were the mission, and the external and internal environments being studied. The third component was made up of defining and identifying applicable deliverables, activities, and events. The model is graphically depicted below in Figure 2- 9.

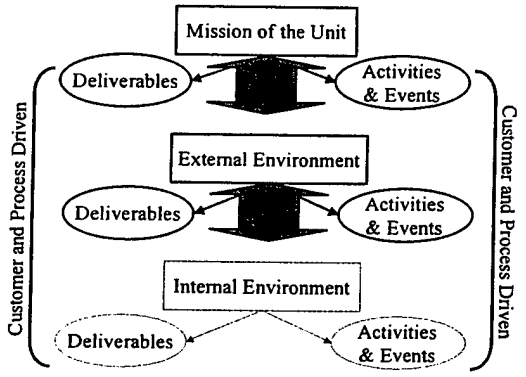


Figure 2- 9. The Operational Environment Assessment Model

The two aspects borrowed from Hammer and Champy's text, *Reenginnering the Corporation,* are customer and process focus. Customer focus is maximizing customer satisfaction and is the overall goal. All decisions should be focused upon the affects it will have upon the customer.

Process focus is creating an output of value to the customer. This means that processes should be organized around outcomes, not tasks and must not be built around assumptions or any underlying beliefs (Hammer, 1993: 144). It is also important to define a process as a collection of activities that take one or more kinds of input and creates an output that is of value to the customer (Hammer, 1993: 35). Individual tasks within a process do not matter if the overall process is unable to deliver the goods (Hammer, 1993: 35). These two factors are the underlying basis of this research model.

The three key components to assess a unit's current status were incorporated from Pearce and Robinson's text on Strategic Management. Mission is the fundamental, unique purpose of an organization that sets the scope of its operations (Pearce, 1988: 52). The mission of an organization should identify the principal product or service areas and primary customer needs to be satisfied. Understanding one's mission can clearly chart future direction and establish a basis for organizational decision-making (Goodstein, 1993: 20). When formulating its mission, an organization must answer four basic questions.

Table 2- 4. Questions to Ask during Mission Formulation

Mission Formulation—Questions to Answer
Generic Questions
1. What function(s) does the organization perform?
2. For whom does the organization perform this function?
3. How does the organization go about filling this function?
4. Why does this organization exist?

Source: Goodstein, 1993: 17-18

Mission formulation within strategic management planning involves the development of an organizational mission statement. Although the purpose of the research was not to formulate a mission statement, the guidance given is used to determine the unit's mission through doctrine, guidance, literature review, informal interviews, and observations.

In addition, to identifying the mission of the IW Flight, a review of the external and internal environments is necessary to identify concerns that may affect the organization (Goodstein, 1993: 11). Strategic management planning practices attempt to identify environmental items concerning industry, government, competition, and economic, political, social, and technological aspects.

The internal environment is important in acquiring knowledge about ones own internal structure, culture, climate, productivity, distinctive strengths and weaknesses (Goodstein, 1993: 121). In most cases, as the different areas of an organization are explored, a more detailed look is needed. These details are labeled deliverables, activities, and events. A deliverable is something that will be handed over to someone when the effort is completed. This puts the goal and objective in a tangible form (Kelley, 1988: 24). Failure to define and agree upon the deliverable(s) can result in an array of non-focused activity by the members of the organization and often leading to an inability to accomplish the goal. Not defining a tangible deliverable can lead to major disasters because no one is able to assess if the planned actions would result in achieving the goal.

Once the deliverables are agreed upon, activities and events and their relationship to the deliverables must be defined. As Kelley wrote, if the step of defining a tangible deliverable is ignored, there will be no way of knowing whether doing an activity will result in achieving the desired goal (Kelley, 1988: 25). Activities or events are those things that are required to create the deliverables. It is an action that produces a tangible goal or deliverable (Kelley, 1988: 25).

The general model described above was developed to accommodate the characteristics and the problem being studied. It is a combination of a variety of business management techniques taken from business re-engineering, strategic management, and basic planning. It is used to conduct and guide the research through data collection and comparative analysis.

2.9 Summary

This review covered an array of topics in order to present a reference point when reviewing the next two chapters; Methodology and the proposed IW Planning Process. This has provided many definitions that have been overtaken by the way we conduct war in an Information Age. At the operational and tactical levels of operations, most current practices and publications are built around the employment of traditional kinetic weapon systems. This poses a significant problem when doctrine and other high-level directives mandate integration of offensive IW capabilities into the current organizations.

In order to incorporate offensive IW as a primary weapon option into the Aerospace Operations Center, the IO community will have to conform to the desires and needs of its customer, the AOC.

3 Methodology

3.1 Research Process

This chapter describes the overall methodology used to conduct, guide, and assess the results of this research. It first outlines and identifies key factors concerning the research object and the constraints of the operational environment that dictated this research methodology. It then presents a model that was developed to identify the steps required to answer the research question, "How can offensive IW be integrated within the AF as a primary weapon option". In order to manage the many facets of this research, the research was categorized into five stages, each being the basis for the next phase. These stages are identified below.

Stage 0—Initial Assessment of the Research Environment

Stage I—Determination of the External Environment

Stage II—Process Development

Stage III—Assessment of the Developed Process

Stage IV—Analysis of Findings

The chapter contains a description of the model and each stage of the research. Table 3- 4, located at the end of the chapter, summarizes Stages 1-4, the data collection type, and the research results.

3.2 Stage 0—Baselining the Initial Research Environment

In order to perform a comprehensive analysis of the inputs of the AF IO community, several important factors were identified through an initial literature review and informal interviews. The initial research environment included the

identification of the primary and secondary research objects, the problem statement, and the environmental constraints and assumptions. The findings are summarized in Table 3- 1.

Table 3- 1. Initial Environment Assessment

	Who or What	Position or Affect within Environment
Research Object-Primary	IO Planners	Supplier to the AOC
Research Object-Secondary	Aerospace Operations Center (AOC)	Customer/Environment
Problem	How to integrate offensive IW within the current environment	Accomplishment of mission of IO Planner
Constraints/Assumptions	IO Planner is a part of the AOC	No guidance on HOW to be part of AOC
	IO Planner must work within AOC environment	IO Planner should conform to the given environment
	IO Planner is the expert of new capability (IIW and IW)	New capability not explicitly defined

From this initial assessment, it became clear that the focus of research was on the IO Planners and their performance within the Aerospace Operations Center (AOC). As in any research environment, several constraints also became apparent. These constraints were that the IO Planner must conform to the AOC environment and that expert knowledge of IW capabilities was expected. This initial assessment of the problem statement and constraints also dictated a qualitative research methodology that was flexible and allowed for a continuous evolution of comparisons and analysis. In order to maintain study boundaries and give structure to the research effort, the operational environment assessment model was developed and used in Stage 0.

3.2.1 The Operational Environment Assessment Model

A model was built to accommodate the key factors and constraints identified during the initial assessment. The model is a combination of several different techniques common in business management. The approach combines an overall customer orientation and process focus from business re-engineering. The identification of the research object's characteristics of mission and its surrounding environment is incorporated from strategic management. The simple identification guidelines of tangible deliverables and activities come from basic planning steps.

Three key components are used to assess a unit's current status. These components are the unit's mission, it's environment (external and internal), and the applicable deliverables, activities, and events of the organization (Goodstein, 1993: 17-18). These key components are incorporated into the environment assessment model, which is depicted below in Figure 3-1.

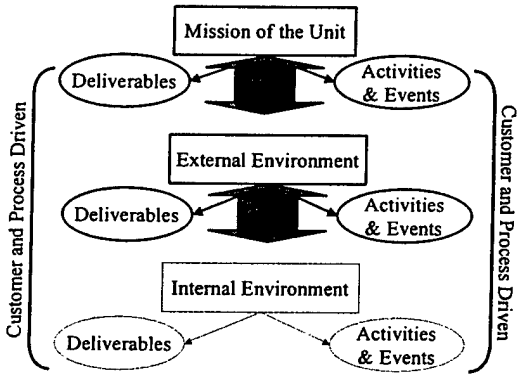


Figure 3- 1. The Operational Environment Assessment Model

Customer and process focus are the two underlying factors of this research model. In addition to being used in Stage 0, this customer and process focus is continuously used and applied throughout the research to ensure the overall data collection, comparisons, and analysis was properly focused on the customer, the AOC.

When formulating its mission, Goodstein suggests, an organization must answer four basic questions. Table 3-2 outlines both the generic and IW Flight specific questions used in this research.

Table 3- 2. A Summary of Mission Formulation Questions

	Mission Formulation—Questions to Answer	
	Generic Questions	**IW Flight Questions**
1	What function(s) does the organization perform?	What is the stated vision and mission of the Flight?
2	For whom does the organization perform this function?	Who are their customers?
3	How does the organization go about filling this function?	How does the Flight accomplish this function?
4	Why does this organization exist?	Is there a reason for the Flight to exist? Why?

Source: Adopted from Goodstein, 1993: 17-18

In addition to asking these questions in an attempt to determine the mission of the IW Flight, a review of the external and internal environments was conducted. This research focused heavily on the external environment of the organization in regards to the customer's mission, needs, structure, and decision cycles.

The internal environment is also important in acquiring knowledge about ones own internal structure, culture, climate, productivity, distinctive strengths and weaknesses (Goodstein, 1993: 121). Since the IW flights are relatively new, internal and individual structures are still being developed. For this reason an exploration into the internal workings of the flight was purposely limited at this time. It is included in the model as a dotted area to emphasize its importance. Once the flights develop further this internal environment should be studied before any significant change is implemented. Knowledge about the unit's internal culture and weaknesses could help in identifying potential acceptance or resistance problems of a policy or vision change of the organization.

As the different areas of the external environment were explored it became clear that a more detailed investigation of these elements was required. The model identifies these as the deliverables, activities, and events. Stage I attempts to identify the deliverables, activities, and events within the external environment affecting the flight. It does this by determining the external environment of the flight.

3.3 Stage I—Determination of the External Environment

In order to determine a baseline of understanding of the AF IO environment, current literature, AF and joint doctrine and guidance helped to establish a preliminary overview and were accomplished in Stage 0. This initial baseline acted as the starting point for comparison and analysis in an attempt to identify the basic elements of the organization; mission, organizational structure,

and personnel. As mentioned in the earlier model description, the focus on process and customer would help to determine what the unit must do and then how to do it. It should ignore "what is" and concentrate on "what should be" (Hammer, 1993: 2).

The next step was to answer two broad questions in order to find out what were the deliverables, activities, and events of an IO planner. These questions were:

1. "What decisions or recommendations is the IO planner required to make?"
2. "What are their product deliverables?"

Each question seemed logical and separate, but after closer investigation, they could not be answered without considering the IO Planner's customer, the AOC. Focus had to be placed upon the AOC's needs, the AOC's environment, and the AOC's decision cycles. Although the literature and guidance explicitly stated what the flight's mission and deliverables were, many iterations of data collection and comparative analysis were required to reveal a true picture of what these components consisted of. The data collection included interviews, a field observation at an AOC exercise, as well as reviews of IO and AOC training lesson objectives and plans. This investigation resulted in deliverables of target nominations, weaponeered targets, and assessment indicators.

Once these were solidified, several activities and events became apparent as required for the production of these deliverables. The first was the knowledge requirements needed to be able to develop target nominations, weaponeered

targets, and assessment indicators. The second activity or event identified was the processes and decision cycles of the AOC. The third activity or event that was required was the identification of the process or procedure that would produce the outputs or deliverables in a standardized or systematic way. Table 3- 4, located at the end of this chapter, summarizes the final results of the research.

3.4 Stage II—Process Development

In order to fill the gap identified in Stage I of the research, the development of a process to aid the IO planner in his or her ability to plan and produce the deliverables important within the AOC environment was necessary. In addition, the distinction between using IO as a supporting function to kinetic and traditional systems verses a supported and primary option required a slightly different view then currently being used. This view dictated a proactive and a purely offensive mode, unlike a supporting function, which lends itself to a more reactive and defensive role within an offensive situation.

The research model's focus on the customer and environment continued to aid the identification of the contributing and required activities and events to the various process requirements. The knowledge requirements and the decision cycles within the AOC were the activities and events leading to the tangible deliverables of the IO Planners. The targeting cycle was determined to be the correct model to emulate due to its strong presence within the AOC. It governed all aspects of the environment and all members were deeply entwined

within this process. In addition, each phase of the targeting cycle produced a necessary output that could be the basis for further decomposition, aiding in the decision making processes of the IO planner in all phases of planning; long range, deliberate, and crisis action.

The concept that offensive IW must be considered as a primary weapon option, within the aerospace focused environment of the AOC, required that the IO planner work within the processes of the given environment. In addition, "how" to integrate into the environment was also a basis of concern. These concerns were solved by *mapping* the deliverables of the IO planner to the aerospace and targeting concepts, terms, and decision cycles already present and in full use within the AOC. The overall process is presented in Chapter 4.

3.5 Stage III—Assessment of the Developed Process

Once a framework with the appropriate and applicable concepts and definitions were developed, an initial assessment was essential. Two sets of activities were used to assess the usefulness of the concepts derived and the process developed. The first set of activities is referred to as the presentation and is a briefing presenting the concepts and process to a group of participants. It is accompanied with acquiring written individual feedback questionnaires from each participant. A copy of the feedback questionnaire is included in Appendix C. The group was made up of members from the Air Force Information Warfare Center and ranged from senior level managers (group commander) to mid level technicians.

The second set of activities is referred to as the senior level review. This activity included a personal review of a report outlining the background of the current environment and the proposed concepts and process. The objective of this activity was to attempt to determine, in the participants/reviewer's opinion, the usefulness of the concepts and process to the IO community. The participants were chosen by their position and continued involvement with this and other research efforts within the IO community. Participants within this group were creators, developers, and extensive users of IO at the senior level. Review questionnaires and interviews of the participants were used for this part of the assessment.

Table 3- 3. Summary of Feedback Objectives

Presentation Critiques Objectives: An initial assessment of Usability and Usefulness	Questions to answer: 1. Does the process seem useful? 2. Does the process seem easy to use?
Senior Level Review Critiques Objectives: An initial assessment of Usefulness within the IO community	Questions to answer: 1. Do you approve or disapprove with the process being useful to the IO community? 2. Do you approve or disapprove with each concept identified as being useful to the IO community?

A research summary also appears in Table 3- 4, under Stage III and the assessment instruments are presented in Appendix C. The instruments include briefing slides and feedback questionnaires for both activity levels.

Research Extension: During the course of this research it became apparent that there were several areas of knowledge required of an IO planner. One of these areas of knowledge; our own Offensive IW capabilities, weaknesses, and limitations seemed to be non-existent in any consolidated form. This knowledge is a critical and missing piece to Stage II—IW Weaponeering & Force Application. In addition, this crucial knowledge area, which equates to "know your self", could have implications in every aspect of offensive IW. If this knowledge was used proactively and properly, it could drive long range planning, weapon development and modification, a proactive and effective defensive posture, and even better and more evasive target development.

This research extension of the process was also performed with a focus on its applicability and understanding to further decompose the IW battlespace. The goal was to use the concepts in Stage II to decompose the information battlespace to a lower and more useable level than the effect point. This extension included brainstorming sessions with groups of two to five participants from a myriad of disciplines that included students of information security, students at the IO schoolhouse, researchers, and members of the AF Information Warfare Center. The session stepped the group through a process of identifying weapon or action characteristics (tactics, delivery platforms, and payloads) for one of the attributes of the information battlespace. The end result was a list of actions that would affect an attribute of the information environment in the desired way. In addition, effects assessment indicators were also determined for each action identified.

Feedback regarding the usefulness of the process and concepts were solicited upon completion of the brainstorming session from each participant. A comment sheet or "After-Session" questionnaire form was used. The objective of the feedback form was to determine if the process presented, was or would be usable and useful to identifying types of offensive IO actions in the opinion of the participant.

3.6 Stage IV—Analysis of Findings

Analyzing the questionnaire from each activity; presentation and the senior level reviews were focused on answering the questions presented in Table 3- 3. The assessment process consisted of the tabulation and analysis of the presentation or senior level review feedback questionnaire by each participant. The purpose of this part of the assessment stage was to determine if the concepts and process appeared to be useful and usable.

The presentation questionnaire is broken down into three parts. Part 1 is represented by two questions presented with a five-option response. This part is used to determine the participant's opinion about the proposed process' usability and usefulness. Part 2 and 3 are made up of one question each with identified areas to indicate a positive response. In addition, written responses are requested to further understand the opinion behind the answer.

The senior level review questionnaire is broken down into four parts. Part 1 is represented by 5, five-option response. The participants are asked for either approval or disapproval on the process and other identified concepts in regards

to its usefulness to the IO community. Part 2 and 3 are made up of one question, each with identified areas to indicate a positive response. In addition, each question in Part 2 and 3 allows room for written responses. Part 4 were used to solicit "General Comments". These questionnaires were sent out with the report, but were not a requirement for a response.

3.7 Summary

The research conducted in this study included an initial assessment of the IO environment, the development of a research model, grounded research methods of data collection and comparative analysis, process development, and subject matter expert assessments. In order to systematically progress, the research was broken into five stages to allow for the decomposition and analysis of the mission, environment, deliverables, and the applicable activities and events. Stages 1-4 of the research process are summarized in Table 3- 4.

Table 3- 4. Summary of Research—Stage I through Stage IV

Research Focus	Data Collection Type	Research Results—Deliverables, Activities and Events
Stage I—Determination of the External Environment		
Determination of Environment and Customer Needs	Literature Review-Business Process Reengineering, Systems Analysis, Process Identification, Deliverables based on customer needs	Environment --NAF and JAOC Customer Needs -Attainment of objectives thru desired effects thru affected targets
Determination of IO planner decision requirements—OPERATIONAL Level of Operations	Literature Review-Joint and Air Force Doctrine, Operations Concept, Training Plans and Objectives (IO and AOC) Field Observations-Blue Flag Field Observations-IO Schoolhouse Capstone Attended-AOC training	Decision Requirements/Deliverables --Information Requirements --Target Development --Weaponeering --Assessment Requirements
Determination of IO planner knowledge requirements—OPERATIONAL Level of Operations	Same as above	Knowledge Requirements --Battlefield Characteristics --Adversary's Characteristics --IO Weapon Capabilities
Determination of applicable decision cycles within environment of IO planner— OPERATIONAL Level of Operations	Same as above	Decision Cycles/Environment --Targeting-Weaponeering Cycle --Air Tasking Order Cycle --Information Realm (Hierarchies)
Determination on how to integrate definitions/concepts	Same as above	No single standardized process
Stage II—Process Development		
Develop systematic process Goal: Customer focused, useable, and useful	Basis: Targeting Cycle with focus on end product deliverables of the ATO production cycle	Process --Step-by-step method/process --Common definitions/environment --Input to feedback
Stage III—Validation of Process		
Briefing/Presentation Validate Developed Process Goal: Initial Face Validity	Semi-Structured Briefing Participant: AF Information Warfare Center Personnel	Briefing --Background, concepts, definitions --Process Breakdown
	Individual Session Feedback Objective: Assess opinion upon usefulness and usability of concepts, definitions, and process	Critique Results --Usability --Usefulness --Future Use --Improvement Recommendations
Senior Level Validate Developed Process Goal: Assess usefulness within IO community	Report Review (Chapter 2) Participant: Senior/Mid-Level Managers involved in policy formulation and implementation of IO concepts	Full Report Review --Background, concepts, definitions --Process Breakdown
	Review Critiques Objective: Assess opinion upon the usefulness within the IO community	Critique Results --Usefulness within community
Stage IV—Analysis of Findings		
Analyze Feedback	Five option response and Content Analysis	Identify usability and usefulness from inputs from individuals

4 The Offensive IW Planning Process

4.1 Introduction

> "In many respects, one can consider information as a realm, just as land, sea, air, and space are realms. Information has its own characteristics of motion, mass, and topography, just as air, space, sea, and land have their own distinct characteristics."
>
> "Land, sea, air, and space are realms within which we may conduct military operations. Each realm imposes its characteristics on operations within it. Information and its functions also may host military operations, but those operations must conform to the characteristics of the information system and its functions."
>
> Cornerstones, 1995: 8

This chapter is a synopsis of findings of an exploratory and comparative analysis conducted to understand and define the current IO environment at the operational level of operations. The research is based upon the premise identified by the above statements, that information is a realm, that it holds its own characteristics that must conform to the characteristics of the information systems and its functions (Cornerstones, 1995: 8). In order for the information realm to take shape, this research identifies the IO mission, defines the offensive IW mission, identifies its organizational structure and IO planner's deliverables, and manpower. It then defines the goal of offensive IW, its target sets, its decision environment, and its battlespace.

The final portion of this chapter is dedicated to giving these concepts and definitions a framework by suggesting a useable and useful process, called the Offensive IW Planning Process. This process will allow movement and

integration of offensive IW as a primary weapon option into the activities of the current and given environment of the Air Force.

4.2 The Mission of Air Force Offensive IW

The mission to integrate IO, as stated in the AF CONOPS, is a difficult task that will require changes within the organizational structure, the mission, the personnel, and the process. The tactical level is where the primary focus is to deny, disrupt, destroy, or otherwise control an adversary's use of information (JP 3-13, 1998: II-11). The operational level is where the theater planning of tactical execution begins.

"AF IW efforts will focus on implementing IW capabilities through warfighting component commands in support of joint warfighting commands" (AFDD 2-5, 1998: 7). In addition, IW activities and operations must be integrated within the normal campaign planning and execution process, making its consideration and use second nature (AFDD 2-5, 1998: 7). It must become a primary weapon system of consideration and use as a supported, and in supporting, the achievement of strategy and objectives at all levels of operations.

The Air Force's current vision and mission for IO is to establish and maintain information superiority over the adversary and to provide the best battlespace information to the right place—anywhere, anytime (AF CONOPS, 1999: iii). Offensive IW activities are conducted to control the information environment in response to acquiring information superiority, therefore, enabling the accomplishment of objectives (AF CONOPS, 1999: 1). Coordination and

synchronization of defensive and offensive actions are essential to incorporate full spectrum IO capabilities across the entire battlespace (AF CONOPS, 1999, 4). The IO focus upon achieving Information Superiority is apparent and explicitly identified within doctrine.

As in any organization, the mission and vision is the driving force and directly contributes to the direction and focus of a unit. The IO community is no different. In order for offensive IW to become a primary weapon option, this thesis postulates that offensive IW must refocus its mission upon achieving another core competency; Precision Engagement. It must also achieve ...

> "...the ability of forces to locate, surveil, discern, and track objectives or targets, select, organize, and use the correct systems; generate desired effects: assess results; and reengage with decisive speed and overwhelming operational tempo as required, throughout the full range of military operations."
>
> Joint Vision 2020, 2000: 28

Without this mission of achieving Precision engagement, offensive IW will always remain as a supporting function to other weapon systems in achieving information superiority.

4.3 The Organizational Structure, The Manpower, and The Deliverables

The organizational structure of IO at the operational level was set by the incorporation of the IW flight embedment within selected MAJCOMs and Numbered Air Forces (NAF) across the world. These flights are also the specialty teams deployed as members of the Aerospace Operations Center (AOC) (AF CONOPS, 1999: 11). The structure, purpose, and mission of the

AOC are the driving force on how IW activities can be incorporated into the Air Force as a primary weapon option. Incorporation into the AOC's major processes is necessary.

The two major processes found within the AOC are the Air Tasking Order (ATO) and targeting cycle processes. Both of these processes integrate requirements, capabilities, and efforts of all command levels.

Figure 4- 1 is re-introduced here in order to highlight the importance of the targeting cycle and the major products of the ATO cycle.

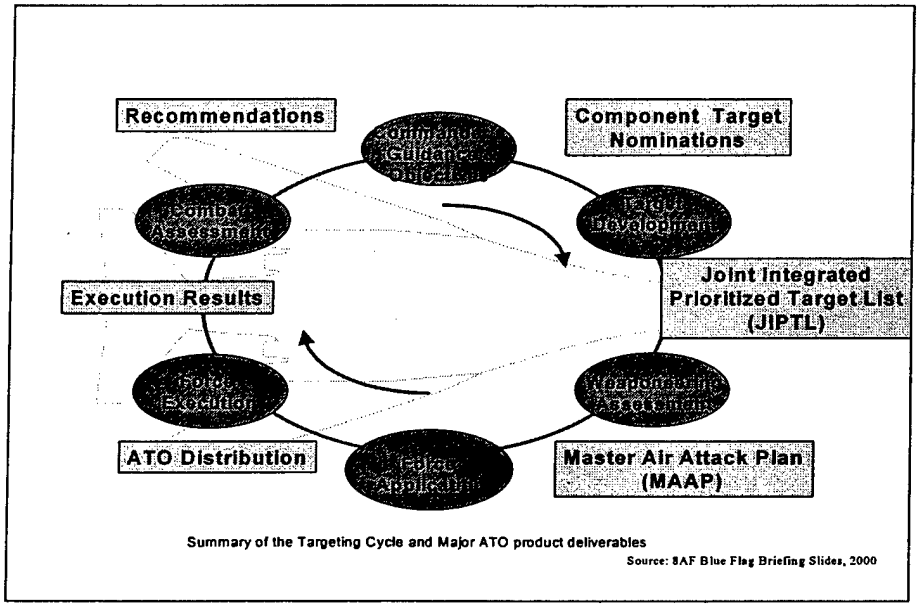


Figure 4- 1. Targeting cycle and ATO product deliverables

Analyzing the major processes, the ATO and the targeting cycles helps to identify the required IO planner inputs and deliverables into these planning

cycles. Figure 4- 2, depicts the phases requiring IO planner inputs, the specific inputs, and deliverables into the planning cycles of the AOC into graphical form.

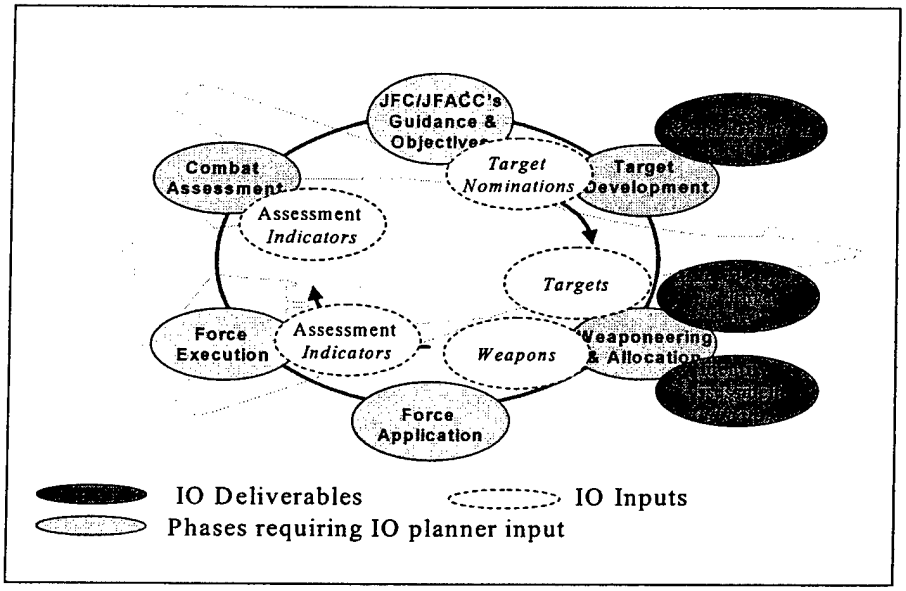


Figure 4- 2. IO Deliverables and Inputs

As a result of the analysis of the targeting and ATO cycle, the IO planners are directly responsible for three major products; target nominations, weapon assignment, and assessment indicators. The first IO product is target nominations, which are the possible target elements that could be affected by an offensive action. Targets that are eventually selected are included into the Joint Integrated Prioritized Target List (JIPTL). The second product is weapon assignment. In order to incorporate IW actions into the Master Air Attack Plan (MAAP), IW weapons must be assigned to their appropriate targets. The third major input by the IO planner is assessment indicators. These indicators must be fed into the intelligence collection requirements system in order to aid in the

development of execution results upon completion of the force execution phase and commencement of the combat assessment phase.

In short, the analysis of the AOC's organizational structure and processes dictate timing and product requirements from all combat planners. As part of the AOC, the IO planners are directly responsible for the three major products that identify IW related resources, which feed into the sub-processes within the ATO and targeting cycles. These products are target nominations, weapon assignment, and assessment indicators.

All planners within the AOC must combine intelligence about the adversary (threat, target systems, target characteristics) with operations data on resource capabilities (force posture, weapon systems and capabilities, weapon effects, objectives, rules of engagement, and doctrine) in order to accomplish proper targeting, application, and execution. (AFP 14-210, 1998: 7) IW Flight members are the IO planners and focal point for planning and employing this essential integration of adversary characteristics and friendly capability at the AOC level.

As one reviews the function of the IW Flight in light of offensive IW, it becomes apparent the flight is responsible for both deliberate and crisis action planning. The differences between these two planning phases are 1) the decision time factor and 2) frequency of the changing situation or environment. Both deliberate and crisis action planning requires the IO planner to investigate possible target sets and target effect points and attempt to match the adversary's

vulnerabilities with possible IW capabilities to deny, disrupt, degrade or destroy the adversary's use of information.

As the mission, organizational structure, and players within the equation to operationalize offensive AF IO are defined, the unknown variable, the process, becomes an essential missing piece of the successful implementation of IO into the Air Force.

Before a process can be developed, several other and essential concepts and definitions of the information environment must be identified. These concepts and definitions must be defined in order to shape a realm in which military operations can take place.

The next section of this chapter will outline a number of definitions and concepts, in order to lay a foundation enabling the "how" to take place within the current AF structure.

4.4 The Definitions, Concepts, and Foundation

As the AF IO mission, organizational structure, its players, and their deliverables are defined, the unknown variable, the process, becomes an essential piece of the successful implementation of IO into the Air Force.

Before a process can be developed several other essential concepts and definitions of the information environment must be identified. These concepts and definitions must be defined in order to shape a realm in which military operations can take place. This next section of this chapter will outline a number

of definitions and concepts, in order to lay a foundation enabling the "how" to take place within the current AF structure.

In the process of uncovering important variables, it has also identified several important factors not explicitly or clearly outlined. These factors are defined or clarified in Table 4- 1.

Table 4- 1. Summary of Definitions

Terms	Brief Definitions
Primary Offensive IW Goal Tactical Level of Operations	Affecting the information factors of the decisions of the adversary to achieve the desired effect
Information, Information Systems, Information Based Processes (I3)	Target sets that can be devalued and affect quality of information
Decision Environment	Information factors are inputs into decisions which lead to an end result or effect
IW Battlespace	The environment where military IW operations can take place. The basis of it consist of I3 and effect points

Although the table lists the basic definitions of each of the terms used within this research, the following section will define and clarify key factors that will be needed to understand some of the reasons behind the process.

4.5 The Primary Offensive IW Objective and Target Set Determination

As mentioned in the previous section, offensive IW actions should focus on the manipulation or destruction of information in order to support efforts to affect the desired strategic, operational, and tactical objectives or effects.

Several US documents point to the human as the main target in IO. Joint Vision (JV) 2020 states that the ultimate target of information operations is the human decision maker (JV 2020, 2000: 36). The joint publication for Information

Operations goes further stating; offensive IO involves capabilities and activities to affect adversary decision-makers and to achieve specific objectives (JP 3-13, 1998: viii). In addition, offensive IW can target three areas; human decision processes (human factors), information and information systems used to support decision making (links), and information and information systems used to process information and implement decisions (nodes) (JP 3-13, 1998: II-13). JV 2020 warns that it will be equally necessary to understand the complete realm of Command and Control (C2) decision making, the nature of organizational collaboration, and especially the "human in the loop" (JV 2020, 2000: 38).

If the mission and focus of IO is on the end result, one can work backwards to the decision maker and find the most important area acting upon the end results is the decisions made by the decision maker. Although attempting to understand the decision-maker and his or her decision-making process is an important variable, the real concerns are the decisions that result in effects. In addition, focusing on the decision maker and his or her decision-making process narrows the actions that can affect the decision maker without regard for other very important and potentially more accessible targets.

At the operational and tactical level of war, understanding the decision-maker and his or her decision making process is a difficult task. JP 3-13 states that, "the primary focus of offensive IO at this level is to deny, disrupt, destroy, or otherwise control an adversary's use of information and information systems" (JP 3-13, 1998: II-11). The difference between focusing on the decision versus the decision maker can be academic, but a difference can exist if at the operational

level the IO planner lacks sufficient intelligence data to extrapolate to what can and does affect the decisions and the overall effect. The danger is if the target is the decision-maker and/or his decision making process, the tendency to forget the true desired effect and it's associated decision is easily manifested.

This thesis assumes that the overall offensive IW goal is to affect the information factors of the desired decisions of the adversary in order to achieve the desired effects within the area of interest. With this objective several target sets become available. These target sets are the information realm, the decision-maker, and the decision-makers decision-making process. It is important to note that there are two opportunities to affect the information realm. The first is the information realm that makes up the inputs into the decision maker and decision making process. The second realm disseminates the outputs (decisions) of the decision maker and decision making process back into the organization. All of these target sets have one thing in common; all are affected by the quality of its information, information systems, and information based processes.

Figure 4- 3 illustrates the possible target sets that affect the desired effect.

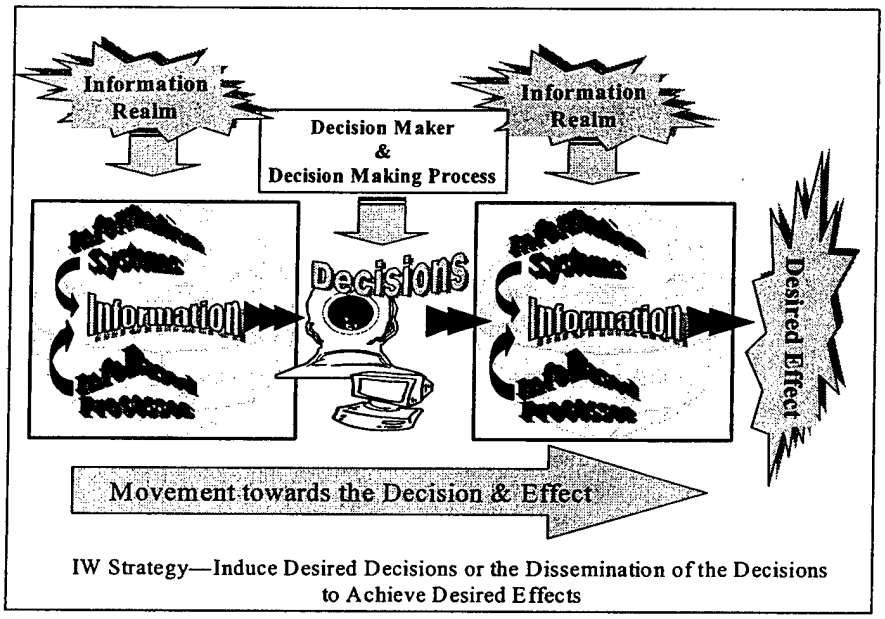


Figure 4- 3. IO Target Sets

Although the distinctions between the target sets of the information realm and the decision maker and the decision making process may seem inconsequential at first glance, they do provide for different offensive actions and tangible assessment measures. For these reasons, the suggested process focuses on affecting the information realm, which defines the target set, the components, and attributes of the environment.

4.6 Determination of the IW Battlespace

The determination of the IW Battlespace is built around a decision environment concept presented in this next section. The basis of this concept is that the decision is affected by the quality of information or information factors required, presented, and accepted by the different levels of decision-makers.

Therefore, it is the objective of offensive IW, at the tactical level of operations, to affect or devalue the quality of information or information factors received from the processes and systems used by the adversary as inputs into the decision or as the decisions are disseminated back out into the organization. Figure 4- 4 illustrates the decision environment of an adversary.

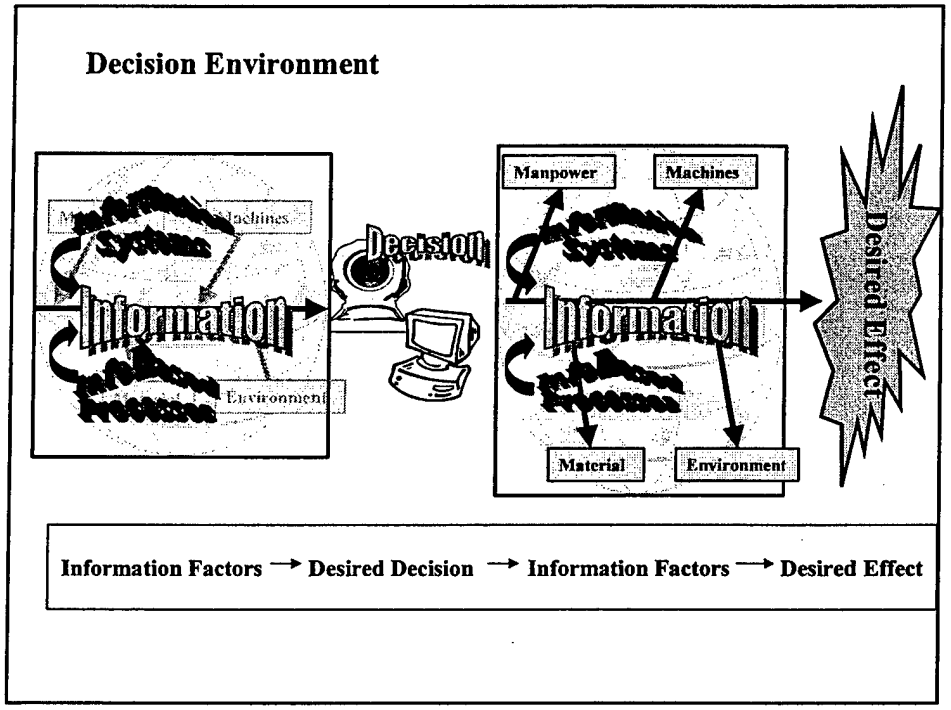


Figure 4- 4. Decision Environment

In order to affect the information factors of the decision environment is through the Information Realm target set. The only widely accepted doctrine and guidance of the information realm is to the component level of Information, Information Systems, and Information Based Processes (I3) (JP 3-13, 1998: vii). For the purpose of presenting offensive IW as a primary weapon option, this breakdown of the information realm must be further decomposed.

The decomposition used as the basis for defining the IW battlespace is a model developed by Capt Michael P. Doyle to represent the information realm called the Value Hierarchy for the Information Realm. It also incorporates a costs hierarchy. The models are based on value-focused thinking, a decision analysis approach. It is the representation of value attributes of the information realm that is complete, nonredundant, understandable, and operational. (Doyle, 1998: 3-9) As offensive IW objectives are applied to devalue the quality of the information received by the decision-maker, the model transforms into an Objectives Hierarchy for Offensive IO and cost objectives (Doyle, 1998: 3-10). These hierarchies were referenced in Chapter 2.

Capt Doyle's models depict the Information Realm to a level where information can now be affected. The IO planner can now focus in on the adversary's effect points that will affect the information received and required to make a decision. The decomposition presented within this realm; Information, Information Systems, and Information Based Processes and its associated attributes are suitable as the basis for target set and effect point identification and the beginning of the formation of an IW Battlespace.

Several modifications have been incorporated in order to simplify some of the original terms presented in Capt Doyle's study. In addition, the original models were not developed to be used as proposed here; therefore, some modifications were required to align the model with the purpose of this process. Asterisks are used to signify a significant change to the original model. Simple rewording does not signify a change to the model, just a clarification and are not

identified. The proposed IW Battlespace that includes the I3 target set and effect points are illustrated in Figure 4- 5.

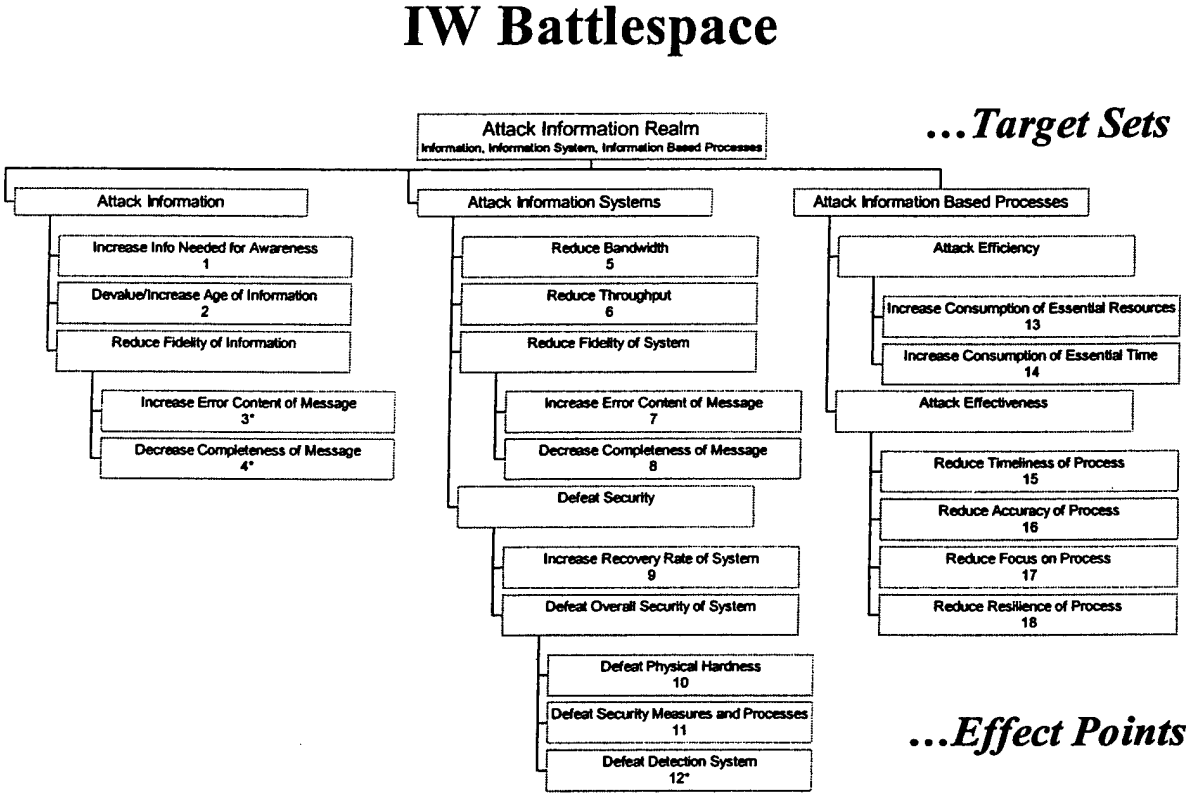


Figure 4- 5. Proposed IW Battlespace—Target Sets and Effect Points

In order to complete the information realm, the costs objectives identified by Capt Doyle are also included (Doyle, 1998) and illustrated in Figure 4- 6. When attempting to minimize cost brought about by target selection and weaponeering, all aspects described here should be considered. In addition, a financial cost may also be imposed upon the decision.

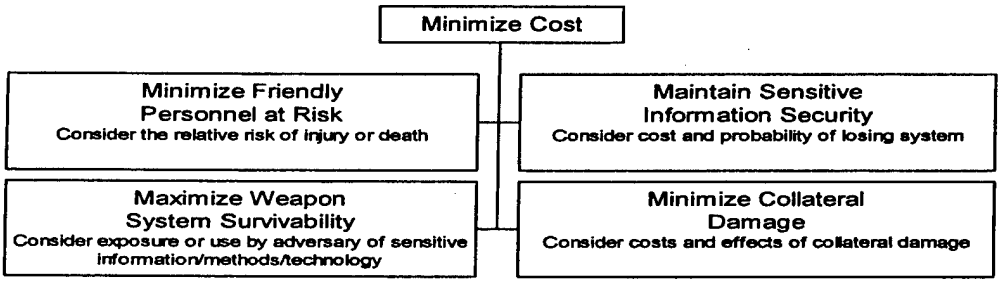


Figure 4- 6. Offensive IW Cost Objectives

Another important piece of Capt Doyle's Value Focused Thinking models of offensive IO objectives and cost are the associated measures of effectiveness identified for each value and cost attribute (Doyle, 1998). These associated measures of effectiveness are summarized in Table 4- 2, with the appropriate modifications. All of the models are used within the proposed process as a means of identifying possible offensive actions and their appropriate effects assessment indicators (EAIs).

Table 4- 2. Measures of Effectiveness of Attributes and Costs

	Defined Objective	Offensive Action*	Measurement Unit	Measurement Type	Lower Bound	Upper Bound
1	Increase amount of Information needed for awareness	Manipulate & destroy information needed	Level of support required to maintain awareness level	Category	User-level	Maintenance Level
2	Increase Age of Information	Manipulate & destroy updates	Number of change cycles since update	Quantity	0	5
3*	Increase Error Content of Message	Manipulate & destroy content of message	Relative amount of meaning retained	Category	No Change	No Meaning Retained
4*	Decrease Completeness of Message	Manipulate & destroy completeness of message	Percentage of Error Content	Percentage	0	100
5	Reduce Bandwidth	Manipulate & destroy available bandwidth	Relative Level of Bandwidth available	Category	No Change	Deny Flow
6	Reduce Throughput	Manipulate & destroy available throughput	Relative Level of Throughput available	Category	No Change	Stop Flow
7	Increase Error Content Imposed by System	Manipulate & destroy content of message corrected by system	Percentage of Error Content	Percentage	0	100
8	Decrease Completeness of Message Imposed by System	Manipulate & destroy completeness of message corrected by system	Relative amount of meaning retained	Category	No Change	No Meaning Retained
9	Increase Recovery Time	Manipulate & destroy recovery time of system	Change Cycles over which the System is unable to perform	Quantity	0	5
10	Penetrate Physical System	Manipulate & destroy physical hardness of system	Level of Defeat effected	Category	No Capability	Completely Defeated
11	Defeat Security Measures and Processes	Manipulate & destroy measures and processes	Likelihood of gaining access to system	Probability	No Change	High Probability
12*	Defeat Detection System	Manipulate & destroy detection system	Expected Ability to Defeat Adversary's Intrusion Detection	Category	Certainty of Desired Effect	Low Likelihood of Desired Effect
13	Increase Consumption of Essential Resources	Manipulate & destroy essential resources	Percentage of Essential Resources Consumed	Percentage	0	100
14	Increase Consumption of Essential Time	Manipulate & destroy essential time required	Percentage of Essential Time Consumed	Percentage	0	100
15	Reduce Timeliness of Process	Manipulate & destroy change cycles	Number of change cycles that the processed product is late	Quantity	0	3
16	Reduce Accuracy of Process	Manipulate & destroy accuracy of process	Percentage of Degradation to Process' Accuracy	Percentage	0	100
17	Reduce Focus on Process	Manipulate & destroy focus of process	Expected Ability to Redirect Process	Category	No Change	Completely Redirected
18	Reduce Resilience of Process	Manipulate & destroy adaptability and recovery of process	Expected Ability to Reduce Process Adaptability and Recovery	Category	No Change	Complete Failure
C1	Minimize Risk to Friendly Personnel		Relative Level of Risk	Percentage	0	100
C2	Minimize Sensitive Information Security		Expected Level of Proliferation	Percentage	0	100
C3	Minimize Weapon System Survivability		Expected Probability of Survival	Probability	0	1
C4	Minimize Collateral Damage		Expected Level of Collateral Damage	Percentage	0	100

Source: Capt Michael P. Doyle, AFIT Thesis, 1998.

Affecting the information factors within the decision environment of the adversary is the basis for using the information realm as the starting point for the formation of the IW Battlespace. The further decomposition suggested by Capt Doyle solidifies the use of the information realm and the associated attributes and costs as the right environment.

4.7 The IW Planning Process

In addition, to the overall goal of offensive IW and working within the given organizational structure of the AOC forces the requirement to work within the targeting and ATO cycles. The proposed process incorporates the two cycles and aids in the delivery of the required products and inputs as outlined earlier.

The suggested process is an attempt to set a standardized framework for use within the AF IW community in respect to offensive actions. Its purpose is to offer the commander a baseline capability of an AF IO planner without regard to experience and personality. The process also offers assurance of a standardized "all options explored" analysis of the information battlespace.

The process was developed with regard to the organizational structure and process cycles within the AOC and with the AF IW Flight members as its user. It is well understood that specific operational details, when employing offensive IW capabilities, will be dictated by theatre specific characteristics and situational circumstances.

The intent of this proposed process is to use the process in both phases of planning; deliberate and crisis action.

The suggested process rebundles the steps of the targeting cycle affected and controlled by the IO planner and forces him or her to focus on producing products tied to the major milestones and deliverables required within these planning cycles. The process is made up of four phases; Effects Based Target Development, IW Weaponeering and Force Application, Force Execution, and IW

Combat-Assessment Analysis. Figure 4- 7, illustrates the four areas the process covers and the desired end products or deliverables. This process has been reviewed at each of its phases of development by a number of IO/IW experts. Their comments and inputs have been used to refine the process.

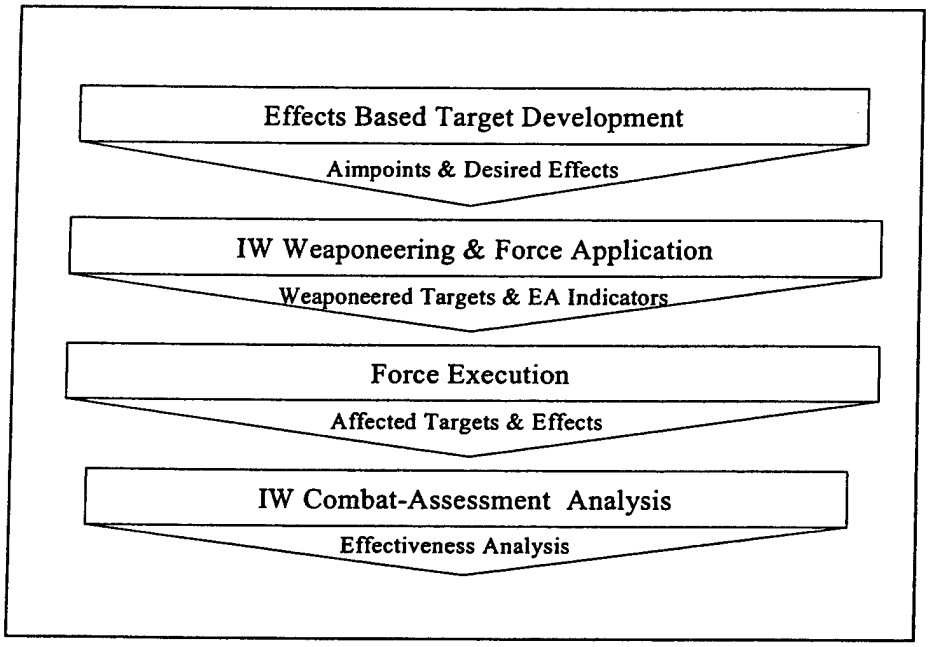


Figure 4- 7. The Suggested Process—Operational Level of Operations

The next section of this chapter will discuss the different phases of the proposed process. It attempts to present a simple, systematic, and comprehensive process that would eventually become second nature to all IO planners at the operational level of operations.

4.7.1 The Effects Based Target Development Phase

The effects based target development phase combines the first two steps of the targeting cycle; Objectives/Guidance and Target Development with the IW deliverables of aimpoints (target nominations) and the desired effects.

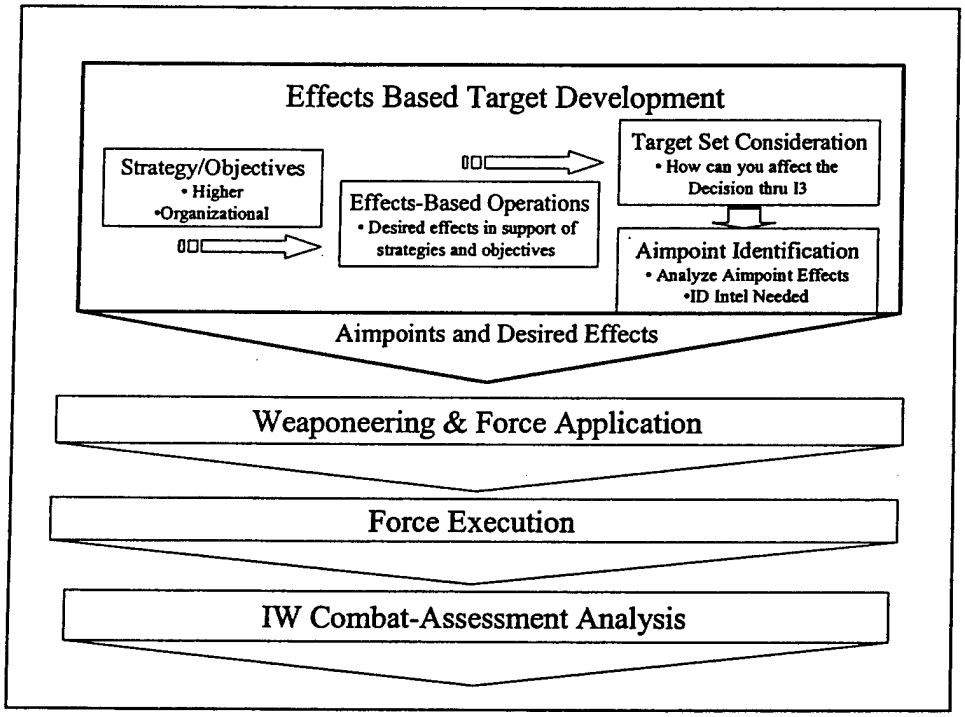


Figure 4- 8. Phase I—Effects Based Target Development

In this phase, all steps should be performed at all levels of operations; strategic, operational, and tactical without regard to the weapon system to be used. The objective is to determine the desired decision and the desired effect upon the adversary and determine the target set and effect point that will result in the desired effect.

As an IW focus is applied to this phase, the underlying assumptions, as presented earlier are summarized below.

1. The objective of offensive IW is to affect the information in order to induce a desired decision, therefore achieving the desired effect.

2. Decisions are affected by the quality of information factors received, accepted, and disseminated by the adversary.

3. Target sets are associated with the information realm components of information, information based processes, and information systems.

4. Target effect points are associated with the information realm value attributes.

With the information realm representing the IO planner's battlespace or environment of operations, planners should identify the possible effects to these target sets that may support the stated strategy and objectives.

Once it is determined which component of the IW Battlespace can possibly be attacked to accomplish the desired effect, then effect point identification analysis would commence. Initially, the process is performed to identify single actions (non-synergistic combinations) with the reasoning of trying to understand the effects for each attribute when attacked by a certain weapon capability. This helps to better identify simple solutions and lead to only those actions needing to be combined in an attempt to get a synergistic effect.

The recommended sequence of analysis is to identify all components of I3 that would lend itself to being attacked, resulting with the desired decision and effect. Once the components were identified, possible effect points would then be analyzed. This is done by isolating each value attribute within the appropriate component and determining if affecting or devaluing the attribute would/could has the desired effect upon the decision.

After identifying all the possible attributes that could have the desired effect upon the information realm, the next step would be to apply an initial feasibility assessment. If performed within the deliberate planning phase, this could identify possible intelligence requirements gaps needed to affect this specific attribute and further identify specific aimpoints available. In addition, new or modified weapon capability requirements for the theatre could also be identified.

The following are some of the possible questions a feasibility assessment might wish to answer. The purpose of the assessment is to identify the shortfalls as well as eliminate the obvious, unfeasible aimpoints.

Weapon Characteristic Requirements:

1. How persistent does the weapon have to be to accomplish the desired effect?
2. How precise does the weapon have to be to accomplish the desired effect?
3. Do we have the required capability?
4. Can we modify a current weapon or obtain the capability?

Information/Intelligence Requirements:

1. What type of information/intelligence is needed to ensure the desired effect?
2. What type of information/intelligence is needed to ensure its precision?
3. Can we acquire the needed information?

Risk Management Assessment Requirements:

1. How complex is the action of attacking this particular aimpoint?
2. What's the probability of success/failure?
3. What's the impact if the attack fails?
4. Does the impact (criticality/cost) of failure outweigh the possible benefits of the action?

Although this phase can be tedious, it is critical. It also sets the stage for the rest of the process. Through the use of the IW Battlespace, identifying

possible effect points and then the specific target and its aimpoint to achieve the desired effects, allows the planner to analyze the weaponeering phase better and helps in identifying possible, probable, and observable indicators of action success or failure.

Before moving forward, a word of caution is necessary. It is necessary to avoid the temptation to jump to a solution before applying all offensive IW capabilities to each attribute, especially during deliberate planning. Systematically going through this phase can help to identify any shortfalls in intelligence and capabilities, and potentially identifying possibilities normally not considered.

The desired effect and selected IW target aimpoints are then passed to the next phase; IW Weaponeering and Force Application.

4.7.2 IW Weaponeering and Force Application Phase

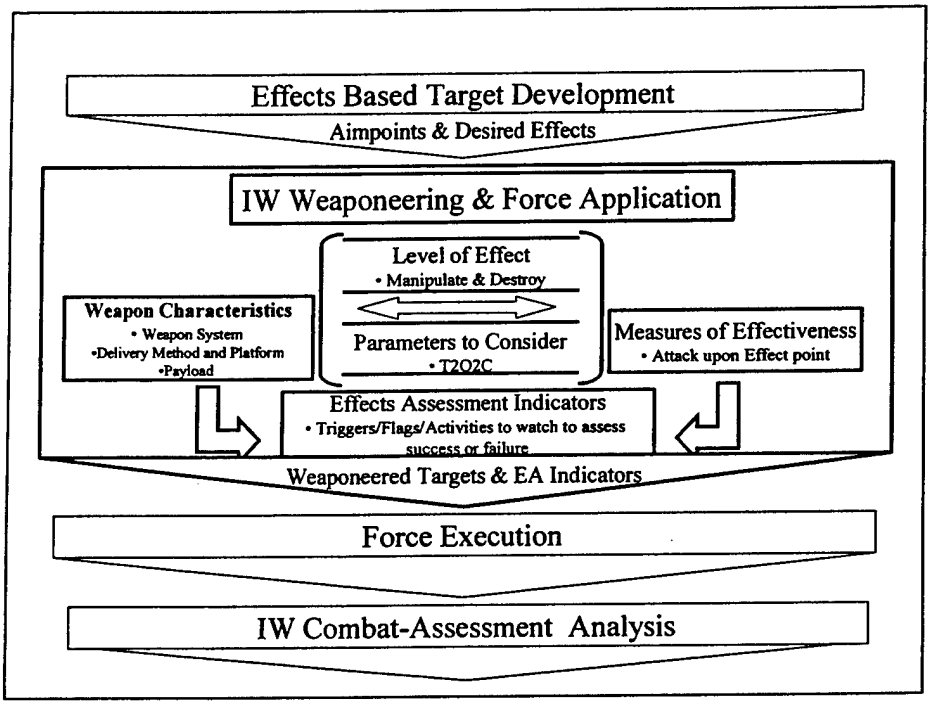


Figure 4- 9. Phase II—IW Weaponeering & Force Application

The IW Weaponeering & Force Application phase matches weapon resources and capabilities to target vulnerabilities in order to achieve the desired level of effect. Analyzing each effect point and selected aimpoint, one weapon at a time, helps to focus on determining which possible capabilities are available and in identifying synergistic combinations later in the process. The two steps within this phase are broken down into areas needing consideration or decisions. The first step is identifying weapon characteristics of the chosen weapon system. Some of the weapon characteristics have already been identified in the previous phase and need to be incorporated here.

To be able to identify the weapon resource that could possibly be used, there are elements of a weapon system that must be considered. These elements can be categorized into three areas; weapon system, delivery characteristics, and payload. These categories are aligned closely with normal weaponeering concepts, but are presented here with an IW focus. In addition, Table 4- 3 defines several terms as used within this research and suggested process.

1. Weapon System
   What is the specific product or action?
   a. The specific offensive IW pillar—PSYOPS, deception, physical attack, electronic warfare, and information attack.

2. Delivery Characteristics
   This is made up of two sub-categories
   a. Delivery Methods
      How are we going to perform the action?
      1. Attributes or Aimpoints
      2. Level of Effect
         i. Manipulate (Deny, Degrade, Disrupt)
         ii. Destroy
      3. Parameters to Consider (T2Q2C)
         i. Timing
         When and for how long do you need the action to take place or the weapon to perform?
         ii. Time
         Is it time sensitive? Does it have to occur in a certain order or at a specific time?
         iii. Quality
         What degree of precision is needed from the weapon? Consider levels of effect as well as inherent weapon capabilities and characteristics.
         iv. Quantity
         What degree of persistence is needed from the weapon? Consider aimpoint characteristics as well as desired effects.
         v. Cost Attributes
         What will be the associated costs (cost objectives introduced earlier) of deploying this weapon?

b. Platform
With what are we going to do this action? What will transport the "effect" to the target?
   i. Equipment
   ii. Manpower

3. Payload or Munitions Characteristics
What will create the desired and appropriate effect? What is required to give us the effect we are seeking?

Table 4- 3. IW Weaponeering & Force Application Terms

Terms	Definitions
Method	This covers "how" the system will be used. This would include the attribute selected, level of effect and the appropriate and applicable parameters to consider
Platform	The equipment, system, or person used to transport the product or action to the intended target
Payload	The active agent or effect mechanism
Levels of Effect	Manipulate and destroy dimensions (Deny, Disrupt, Degrade, and Destroy)
Parameters to Consider	Timing, Time, Quality, Quantity, & Costs (T2Q2C)
Effects Assessment Indicators	Flags, triggers, or events identified to help assessment efforts in observing and analyzing the success or failure of the offensive action in regards to the desired effects

The IW targeteer identifies delivery method and payload characteristics to the level of detail required to employ the action or weapon. Situation and theatre specific circumstances will drive the level of effect and parameters to consider. This is where the "human in the loop" is very important, incorporating the nuances of the current environment into the process. In addition, weapon and target packaging must be further coordinated to ensure the tasking is still appropriate and possible due to any resource or weapon redirection.

The second step in this phase is to identify effects assessment indicators (EAIs). EAIs are flags, triggers, or events of a mission, weapon, or method that can be "watched" for success or failure in obtaining the desired decision and effect. These indicators are based on analyzing the theatre situation, appropriate measures of effectiveness, weapon characteristics, and desired effects.

The weaponeered targets and EAIs are forwarded to the IW Flight's combat operations and IIW personnel for incorporation into current operations and intelligence collection and used in the next phases of the process.

4.7.3 The Force Execution Phase

The Force Execution Phase is when the actual execution of the mission or employment of the weapon occurs. In addition, any redirection and deconfliction of target selection occurs in this phase. An important aspect of this phase is the retargeting and time sensitive targeting opportunities. IO planners are required to have situational awareness and operational knowledge of the current battlespace. This requires inputs from both phase I and II. In order to turn situational awareness into battlespace knowledge and ultimately an appropriate decision, the IO planner will need more knowledge then weaponeered targets and the appropriate EAIs. He or she will have to know "why" these targets were selected and the desired decisions and effects. This type of comprehensive knowledge about what is wanted and what should happen would assist the IO planner in making critical and timely real-time targeting changes if indicators are prematurely observed.

The deliverables, affected targets and assessment information, although not controlled by the IO planner within the AOC, are passed to the next phase of the process. These deliverables are gathered and analyzed in the next phase.

4.7.4 The IW Combat-Assessment Analysis Phase

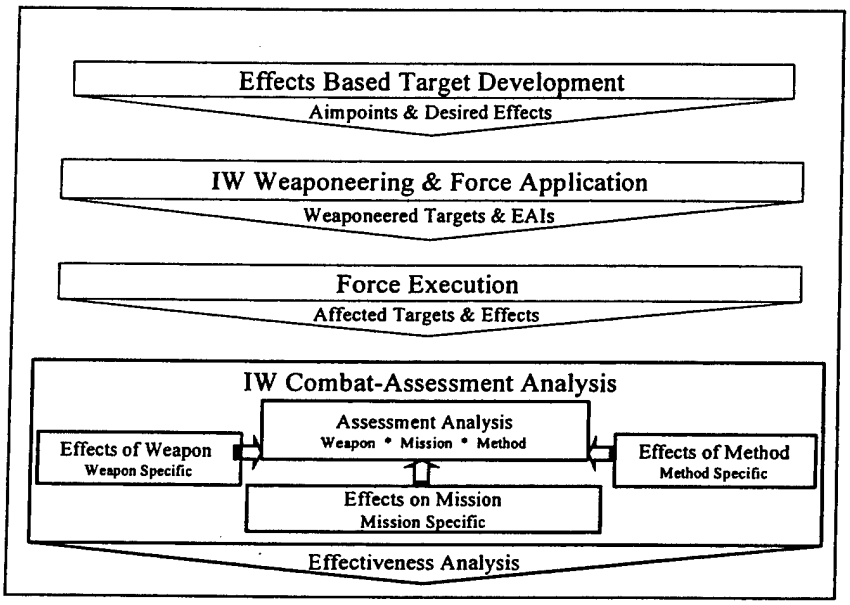


Figure 4- 10. Phase IV—IW Combat-Assessment Analysis

The IW Combat-Assessment Analysis is the essential feedback mechanism to identify success or failure of the different aspects of offensive and defensive effectiveness. In parallel with conventional combat assessment, IW offensive assessment is broken down into several different areas of concern. Figure 4- 10 illustrates the components of this phase.

Three types of analysis are proposed for the tactical level of operations of IW.

1. Weapon Specific
   This is the effectiveness of the weapon or action's effect to the intended information component and aimpoint.
   Did the action/weapon perform as expected?

2. Method Specific
   This is the effectiveness of the tactics, platform, and payload of the weapon chosen.
   Did the method, platform, and payload chosen perform as expected?

3. Mission Specific
   This is the effectiveness of the action's effect on the decision made.
   Did the action/weapon result in the desired effect?

The output to this phase is the effectiveness analysis, which is fed back into the targeting and ATO cycles. This feedback aids in the adjustments required to ensure effects based operations and planning in meeting the stated strategy and objectives. Table 4- 4 summarizes the general steps an IO planner must accomplish within each phase of the process.

Table 4- 4. Summary of IW Planning Process Steps

Phase I—Effects Based Target Development	A process of target aimpoint selection that focuses on the effect or result an action may produce
Input: Strategy and Objectives Outputs: Desired Effect & Aimpoints	**Phase I Steps**
	Identify Desired Effect
	Identify Desired Decision of the Adversary
	Identify the I3 Component to be attacked
	Identify the attributes within each component to be attacked
Phase II—IW Weaponeering & Force Application	Determining and matching the appropriate types of IW weapon capabilities to the specific target and aimpoint
Inputs: Desired Effect & Aimpoints Outputs: Weaponeered Targets & EAIs Note: More comprehensive feasibility analysis should be conducted during the deliberate planning phase.	**Phase II Steps**
	Identify weapon system that could be used for each selected aimpoint
	Identify the delivery method, platform, & payload
	Identify the Level of Effect possible
	Identify the T2Q2C characteristics
	Conduct a feasibility analysis for each weapon possibility
Phase III--Force Execution	The actual execution of the mission or employment of the weapon. Any redirection and deconfliction of target selection also occurs.
Inputs: Weaponeered Targets & EAIs Outputs: Affected Targets & Effects Note: Planners must also understand the strategy, objectives, desired effects, and desired decisions that represent each target or target package and the associated EAIs.	**Phase III Steps**
	Observe current operations
	Identify any pre-mature EAIs
	Identify time-sensitive targeting requirements
Phase IV—IW Combat-Assessment Analysis	Post strike data assessment analysis based on effects assessment indicators. Three levels of assessment; decision, weapon, and method should be accomplished.
Inputs: Affected Targets & Collection Results Outputs: Effectiveness Analysis Note: Planners must also understand the strategy, objectives, desired effects, and desired decisions that represent each target or target package and the associated EAIs.	**Phase IV Steps**
	Observe operations for EAIs
	Assess Decision effects
	Assess Weapon effectiveness
	Assess Method effectiveness

4.8 Conclusion

The concepts, definitions, and process presented are developed to suggest one possible way of working within the current and given Air Force environment and implementing IW as a supported and primary weapon choice. It attempts to focus on the commonalties found across theatres and the information community. The concepts are based upon assumptions, interpretations, and conclusions drawn from the doctrine and policy guiding the operationalization of IO.

Its basis is a result of a recombination of old and new in order to operationalize IW capabilities. The first part of this chapter, postulates three new concepts in order to position and shape a realm where IW-related military operations can take place. The first concept is a new offensive mission of achieving Precision Engagement. The second concept is the primary offensive IW goal of affecting the information factors of the adversary's decisions to achieve the desired effect. The third concept is a common view of the IW battlespace of I3 target sets and effect points.

The second part of this chapter suggest a process that is a systematic way to focus on the necessary deliverables in all planning phases within the AOC and also aides in the further decomposition of the battlespace in regards to lower level targets and specific aimpoints. If these concepts are accepted in its entirety, it should aid the IO planners as they strive to position IW capabilities as

a supported primary weapon choice, as well as, a supporting function to the kinetic and traditional forms of warfare.

Chapter 5 presents an assessment of the suggested IO Planning process by both operational level and senior level personnel within the IO community.

5 Assessment Analysis

5.1 The Assessments

Two sets of activities were used to assess the possible usefulness and usability of the concepts derived and the process developed in this research. The first activity is termed the Presentation Assessment. The objective of this activity was to assess the usefulness and usability of the suggested process across a wide range of qualified participants. The second activity was called the Senior Level Assessment. The objective of this activity was focused on obtaining an initial assessment of the usefulness of the different concepts and process to the IO community. Due to the relatively small sample sizes, statistical analysis was not conducted. The data is provided in tabular form.

5.1.1 The Presentation Assessment

The presentation assessment activity was conducted at the Air Force Information Warfare Center and included 25 participants. Two briefings were given to include background material, definitions of concepts, and the suggested process, which is shown in Chapter 4. Feedback questionnaires were handed out at the end of the presentations and participants were requested to voluntarily complete them. The participant's ranged in rank from Technical Sergeant to Colonel. Their level of experience ranged from a new recruit into IO, to extensive targeteering and command and control warfare involvement, to a group commander of the IO group at Kelly AFB.

Of the 25 participants, 17 feedback questionnaires were returned. Of the eight participants that did not respond, only three chose not to fill out the questionnaire. The other five left during the briefing due to prior engagements and were not asked to fill out a feedback questionnaire. This resulted in a response rate of 17 of 20 or 85%. A copy of the questionnaire is provided in Appendix C.

Results—Presentation. The feedback questionnaire was divided into three separate parts. The objective of Part 1 was to assess if the suggested process appeared to be easy to use and/or useful. The actual responses are summarized in Table 5- 1. A graphical representation is presented in Figure 5- 1.

Table 5- 1. Presentation Survey Part 1—Summary of Responses

Presentation Part 1		Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
1	Easy to use	0	0	3	14	0
	% of Response	0%	0%	18%	82%	0%
2	Useful	0	1	0	10	6
	% of Response	0%	6%	0%	59%	35%

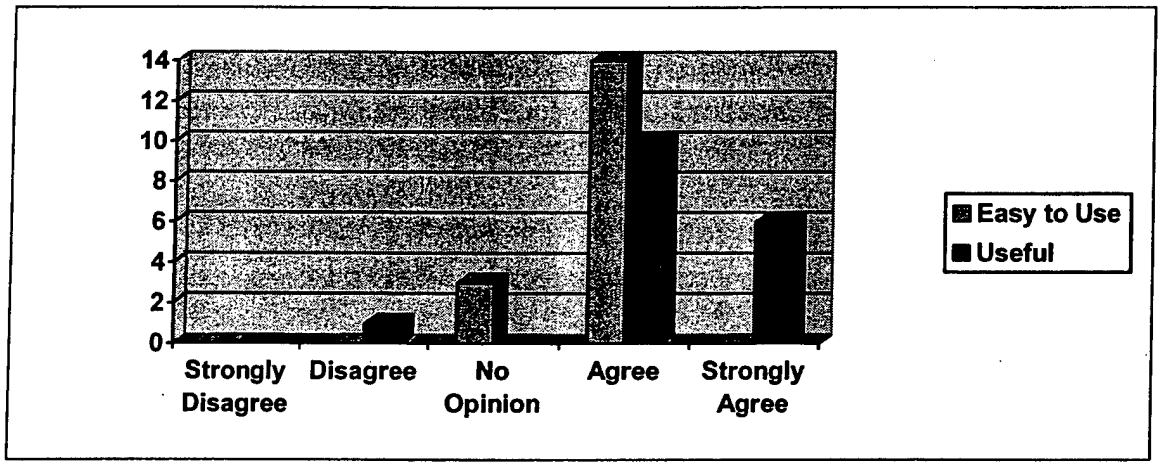


Figure 5- 1. Presentation Survey Part 1—Graphical View of Responses

Part 1 Analysis: The analysis is divide into two possible parts; the respondent's belief that the process was easy to use and usefulness. Fourteen of the 17 respondents believed the process were easy to use, leading to an 82% "belief" rate. In regards to the process' usefulness, 16 of the 17 respondents believed that the process was useful by marking agreed or strongly agreed for a 94% "belief" rate. Both of these areas seem to support a strong belief that the process is easy to use and useful.

Part 2: The objective of Part 2 was twofold. First, part 2 served as a second check on the process assessment for usefulness. Second, it was used to identify any unusual issues in each of the aspects presented in the briefing. These aspects were broken down into three areas; process, definitions, and information environment. As mentioned above, question 2a was included to check if there was a supporting relationship between part 1 and part 2 of the feedback questionnaire in regards to the usefulness of the process. The respondent's results are summarized below in Table 5- 2.

Table 5- 2 Presentation Survey Part 2—Summary of Responses

Presentation—Part 2			
Question	Number of Responses	% of Responses of 11	% of Responses of 17
a. Process	9	82%	53%
b. Definitions	7	64%	41%
c. Information Environment	9	82%	53%

Part 2 Analysis. There seem to be a positive relationship between Part 1, and Part 2 of the feedback questionnaire in regards to the usefulness of the process. Eleven participants responded in Part 2 of the questionnaire. Nine of

the sixteen participants that agreed or strongly agreed in Part 1 (to identifying that they believed the process seem to be useful in identifying possible actions to be taken) also indicated that they would use the suggested process in the future. Three participants gave no responses in Part 2, two did not circle "process" and did circle another aspect, and two made notes in Part 2, but did not circle the area as instructed. The positive relationship between Part 1 and Part 2, serves as a good indicator that respondents (9 of the original 17) consistently believed the process would be useful in the future.

The second objective of Part 2 was also positive. The participants that responded seem to feel that the other aspects, definitions and the information environment, would be of use to them in the future.

Part 3: The objective of Part 3 was to check if any contradictions could be observed in the first two parts of the survey.

Part 3 Analysis: Only one participant chose to circle one aspect, but also noted that it "is important, but lesser of the other two (selections given). Therefore, there seem to be no contradictions.

Summary of Results—Presentation. The respondents provided positive and strong support to this initial assessment of the process' being easy to use and its usefulness. The definitions and information environment presented were also believed to be of use to the respondents. Although, three participants chose not to complete the feedback questionnaire, there was no negative feedback from the participants that did respond.

5.1.2 Senior Level Assessment

The senior level assessment activity consisted of a request to review and comment on a report outlining the background, the concepts, and the developed process. The report was sent over e-mail and responses were through the use of the furnished feedback questionnaires or a personal interview. Feedback questionnaires were distributed, but its use was not mandatory. Responses were accepted in any format. Table 5- 3 summarizes the list of reviewers requested to participate in the review. The reviewers were selected for their experience and their direct exposure to on-going IO research efforts and the development and growth of the IO community.

Table 5- 3. List of Senior Level Reviewers

	Organization	Responsibility or Career	Responded
1	JIOC	J-3 Joint IO Planner	unable-TDY
2	HQ AIA	J-3 Technical Director	yes
3	AFRL	IO Project Mgr	yes
4	AFRL	Retired Vice IO Group CC	yes
5	AFRL	IO Experiment Developer	yes
6	AFRL	C2 Analyst	yes
7	67 IOG	Commander	no
8	39 IOS (School house)	Director of Operations	yes
9	39 IOS (School house)	Targeeter	yes
10	39 IOS (School house)	IO Intel Analyst	yes
12	23 IOS	Commander/Intelligence Officer	no
13	PACAF IW Flight	IO Planner/Superintendent	yes*
14	12AF/IW Flight	Director of Operations	unable-TDY
15	7AF/IW Flight	IO Planner	unable-Leave

*The feedback questionnaire received from the PACAF IW representative was an effort of three IW Flight members. Each member reviewed the report and one feedback form was returned representing a consolidation of their inputs.

Results—Senior Level Review. The objective of this assessment activity was to obtain an initial overall assessment of the usefulness of the concepts and

suggested process across a variety of IO experts within the community. The feedback questionnaire used for this activity was divided into four parts.

Part 1: The objective of Part 1 of the questionnaire was to obtain an opinion regarding the approval or disapproval of the suggested process and other important concepts presented in the research report. The concepts were broken down into five areas; the process, IO as a primary weapon system, the goal of affecting the information factors, the IW battlespace, and the concept of effects assessment indicators. This activity received a 60% (9 of 15) response rate.

Table 5- 4 presents a summary of the responses for Part 1. Figure 5- 2 is a graphical representation of the responses. The nine respondents, while a small sample, do represent a highly qualified group of senior IO personnel in the US Air Force.

Table 5- 4. Senior Level Survey Part 1—Summary of Responses

Senior Level Part 1	Strongly Disapprove	Disapprove	No Opinion	Approve	Strongly Approve
1. Process	0	0	0	3	6
% of Responses	0%	0%	0%	33%	67%
2. Primary Weapon	0	0	0	4	5
% of Responses	0%	0%	0%	44%	55%
3. Goal-Info Factors	0	0	0	4	5
% of Responses	0%	0%	0%	44%	55%
4. IW Battlespace	0	0	0	7	2
% of Responses	0%	0%	0%	78%	22%
5. EAIs	0	0	1	6	2
% of Responses	0%	0%	11%	67%	22%

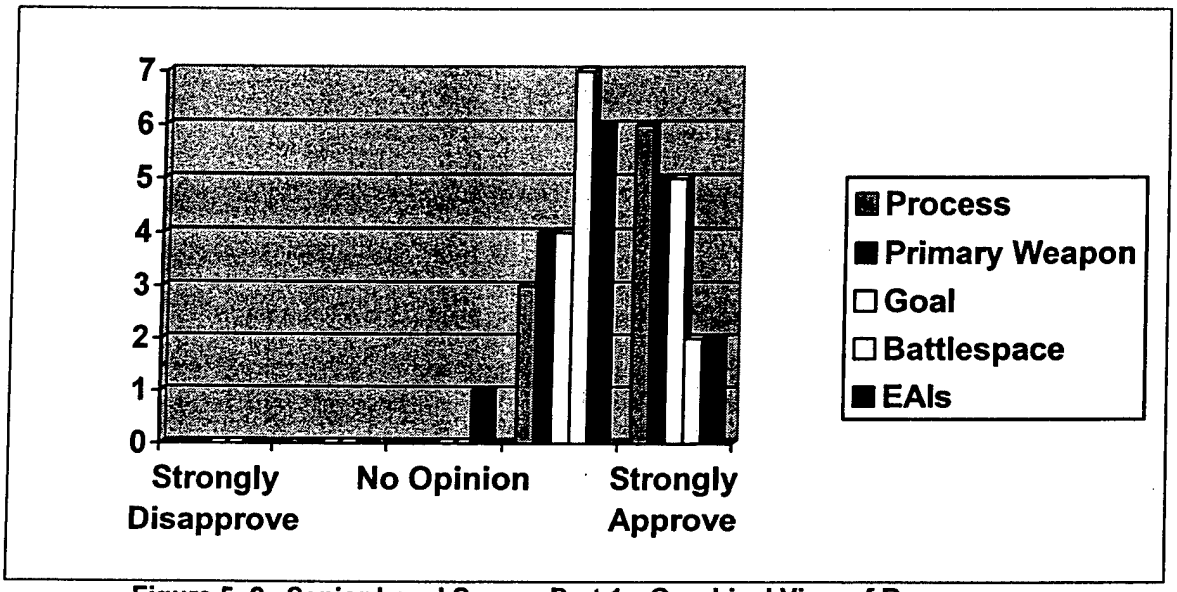


Figure 5- 2. Senior Level Survey Part 1—Graphical View of Responses

Part 1 Analysis: All respondents either approved or strongly approved in all but one of the aspects presented. One respondent expressed "no opinion" in one aspect; Effects Assessment Indicator.

Part 2: The objective of Part 2 was to obtain an initial assessment in regards to the usefulness to the IO community of the different aspects presented in the research. In addition, this part of the questionnaire would also identify any issues or suggestions for improvements. Seven of the nine participants responded. A summary of responses is included in Table 5- 5.

Table 5- 5. Senior Level Survey Part 2—Summary of Responses

Senior Level—Part 2			
Question	Number of Responses	% of Responses of 7	% of Responses of 9
a. Process	5	71%	55%
b. IW as Primary Weapon	4	57%	44%
c. Goal: Info Factors	5	71%	55%
d. IW Battlespace	6	86%	67%
e. Effects Indicators	6	86%	67%

Part 2 Analysis: Seven of the nine respondents used part 2 to explicitly identify those aspects they thought would be useful to the IO community. Three respondents made extensive remarks in this part. The majority of the remarks were comments regarding real world circumstances and hardships being faced by IO planners in the field.

Part 3: The objective of part 3 of this questionnaire was to see if any contradictions to prior responses could be found. In addition, this part of the questionnaire would also identify any issues the participants may have with the different aspects of the research.

Part 3 Analysis: Only one participant chose to circle one aspect, but also noted that it "it was least useful, but not non-useful". Therefore, there seem to be no contradictions to previous responses in other parts of the questionnaire.

Part 4: This part was a catch all category of "General Comments". It allowed the respondents to respond freely to anything and everything presented in the research report.

Part 4 Analysis: Overall use of this part of the questionnaire was very good. All but one respondent wrote a narrative to compliment their inputs. Most comments focused on the IO environment in general and suggestions to the clarify points made in the report. There was one common theme that was easily identified from four of seven narratives. The respondents believed that the report was a great start of focused research needed in the IO community. Several quotes are included below to support this conclusion.

"This effort is superb in that it unfolds the path to the above goal."

Vice Commander, 67 IOG, Retired

"...no-nonsense approach to offensive IW offers a blueprint for future efforts to systematically exploit the information realm to our advantage."

AFRL IO Experiment Developer

"This type of focused research is precisely what's needed for the IO community (and Air Force) to succeed."

PACAF IWF

"AFRL is seriously looking at leveraging and or extending this approach to IW planning for the IWFs."

AFRL Project Manager

"This methodology marries well with the AFTTP 3-1, Vol 36 [Tactics, Techniques, and Procedures for IO], due out late this spring."

IO Intel Analyst

Summary of Results—Senior Level. The responses received from this assessment activity indicated a high approval rate of the different aspects reviewed by the participants. In addition, an overall positive and supporting assessment of the usefulness to the IO community of the different aspects was also found.

5.2 Summary

The analysis of the two assessment activities seems to support an initial overall positive response to the concepts, definitions, and processes suggested within this research. The Presentation assessment seems to indicate that the suggested process appears to be easy to use and useful. The other aspects,

definitions and the information environment seemed to be well accepted as useful.

The Senior Level assessment also indicated high approval in all aspects of the assessment. In addition, this group seems to agree that the concepts and process developed in this research would be useful to the IO community and is just a beginning for further research needed in this area.

6 Conclusions and Recommendations

6.1 Research Conclusions

The Air Force has publicly acknowledged the importance of the information environment by declaring that it should be considered a realm with its own characteristics just as land, sea, air, and space (Cornerstones, 1995: 8). In addition, it also suggests that information has evolved from being a supporting function to being a weapon itself (AFDD 2-5, 1998: 1-2). This acknowledgement is the first step in identifying the need to take action. This research is the next step to identifying the necessary concepts and definitions in attempting to give shape to the information environment as a realm and a potential weapon option. This research has focused on answering the question,

"How can offensive IW be integrated within the AF as a primary weapon choice?"

An exploratory research of constant comparison, progressive analysis, clarification, and evolving conclusions was conducted through field observations, informal interviews, and literature reviews. The research boundaries were set to investigate the AF's offensive component of IW and the affects of single offensive actions.

Although the research identified several important facts about IO, several components necessary to forming a framework were not found and required development and definition. A summary of the items required to transform

offensive IW into a supported and primary weapon option are outlined in Table 6-1.

Table 6-1. Research Results

Facts about IO	Developed Components
AF IO mission—Establish and Maintain Information Superiority	Redefining the Offensive IW mission—Precision Engagement
AF's Organizational Structure—NAF and Aerospace Operations Center	Goal of offensive IW—Affecting Information Factors
IO Planner's Deliverables—Target Nominations, Weapneered Targets, Assessment Indicators	The IW Battlespace—Target Sets, Effect Points, Costs, and Measures of Effectiveness
Personnel/Manpower—IW Flights	Understanding the Decision Environment—Information Factors
	IO Planning Process—Effects based, Weapon Characteristics, and Effects Assessment Indicators

This research has attempted to take doctrine and the current Air Force environment and identify a way to transform offensive IW from a supporting function of Information Superiority to a primary weapon option with a focus on Precision Engagement. It proposes a change in this focus only to compliment the supporting and necessary functions associated with obtaining information superiority.

This research has resulted in various concepts, definitions, and a suggested process in order to help form a framework to be used at the operational and tactical level of operations and within the current AF organizational structure.

6.2 Limitations of the Research

Warfighting requires the synergistic integration of all capabilities (land, sea, air, and space, as well as information) available to be able to appropriately task and expend the correct resources for the right end or desired result. This research is focused upon outlining the Air Force environment with respect to the offensive, single action IW capabilities. Although this can be seen as an overall limitation, knowing the affect of a single action was required as the environment was deciphered and decomposed to identify the possible points that can affect a system. Synergistic combinations can only be built upon the combining of known single actions. In addition, the focus upon the offensive component of Information Warfare, was chosen because knowing what and how a system or environment can be affect or attacked will automatically identify the necessary defensive actions to protect it. Defending systems without knowing what and how it can be attacked can result in a wasteful, unfocused, and reactive defense plan.

6.3 Recommendations for Future Research

Information Warfare, which is comprised of both defensive and offensive actions, requires extensive and continued research in order for it to continue to evolve into a primary weapon option within the Air Force. The suggestions identified here pertain to this specific research effort.

The process suggested in this research requires further decomposition to be able to be used within the day-to-day operations of the AF IW operations.

Appendix A provides a concept and procedure in attempting to decipher and decompose the IW battlespace. Through several pilot studies conducted during the course of this research, it became apparent that a repository of generic targets and possible offensive actions could be identified using this procedure. A research opportunity exists for the comprehensive decomposition of the IW battlespace.

Another research opportunity would be to conduct a field validation of the suggested process. Although the process has been defined and received an initial positive assessment, a field experiment would help to identify the strengths, weaknesses, and limitations of the definitions, concepts, and process.

One of the major deliverables of the IO planner is the development of target nominations and assessment indicators. Another research opportunity lies in attempting to validate the concepts and definitions proposed within the IW Weaponeering and Force Application phase of the suggested process. The concepts and definitions can be tested by actually trying to develop target aimpoints, weapon characteristics, and appropriate assessment indicators.

6.4 Recommendations

The IO community has come a long way since the release of *Cornerstones* in 1995 and the acknowledgement that the information realm had its own characteristics as do land, sea, air, and space. It has gone through a great deal of refining since then, but as this research has shown (reference Table

6- 1), it still has a long way to go as it attempts to integrate IO into the current AF environment.

There are many hurdles facing the IO community, but three are identified here with possible recommendations for action. The first is the reluctance of the community to separately analyze and identify the requirements of the two pillars of IW; attack and defend. This thesis postulates that awareness and knowledge of possible offensive actions upon its battlespace must be identified and analyzed before a proactive approach to integrating IO can take place. Although offensive actions must be closely integrated with the defensive component, offensive capabilities of oneself and ones opponents should drive and determine its defense. Using a football analogy, a team cannot win or score without engaging its strengths and capabilities upon the opponent's weaknesses in its offensive plays towards the goal. Although a good defense may keep the opponents from scoring, it does very little towards moving the team towards its ultimate goal of winning. As suggested above, awareness and knowledge about offensive capabilities (both our own and the adversary) must be identified in order to better defend and ultimately act and win. Until the offensive side of IW is proactively identified, analyzed, and cataloged, IW will always remain in a reactive and supporting role.

The second hurdle can easily be surpassed by focusing offensive IW on accomplishing precision engagement. This goal goes hand in hand with the above recommendation of proactively analyzing the offensive component of IW and how precise engagement must be accomplished. This recommendation

does not lessen the importance of the current IO mission of achieving Information Superiority, but emphasizes its importance and the necessity of supporting the other and essential core competencies, including precision engagement in the ultimate goal of accomplishing strategy and objectives. The capabilities of offensive IW must use the benefits of information superiority towards identifying the required factors in the attainment of engaging its actions and weapons in a precise manner.

The third hurdle is the lack of an IW specific battlespace with its own characteristics to conduct military operations. IW must proactively start to identify its own target sets along with effects points, costs of deployment, and measures of effectiveness.

The IO community faces many hurdles in its integration efforts within the AF, however incorporation of the above recommendations could definitely aid in succinctly positioning itself as a separate realm with its own characteristics. The IW Battlespace, associated concepts, and proposed process introduced in this research would be a great starting point in setting the framework for the integration of IO within the AF as a primary weapon option.

A Appendix—Research Extension

A.1 Introduction

The purpose of this appendix is to introduce the next step in vectoring offensive IW as a primary weapon option within the current AF environment. This appendix is an informal extension of the proposed process with the main objective of decomposing the IW Battlespace in support of accomplishing the IO Planner's target nomination deliverable and acquiring a better knowledge of offensive IW actions.

To conduct offensive IW actions at the operational and tactical level of operations, there are three important knowledge requirements; battlefield characteristics, adversary's characteristics, and our own weapon characteristics and capabilities (AFI13-1AOC, 1999: 8). The process proposed presents several different ideas and concepts, which begin to address some of the knowledge requirements of the battlefield. These concepts are listing below.

a. A realignment of the offensive IW objective (Affect Information Factors to Induce the Desired Decision to achieve the Desired Effects)

b. An IW Battlespace of common Target Sets and Effect Point

c. A common planning process aligned with the targeting cycle and focused on end products/deliverables

The knowledge of the adversary's characteristics can be identified by the intelligence function termed the intelligence preparation of the battlespace. In the past, much of this support function has been focused upon the collection

requirements for the deployment of conventional methods of defensive and offensive actions. The information requirements to deploy IO weapons have been identified as a challenge to the intelligence community, requiring unprecedented levels of detail through compressed collection timelines to collecting and analyzing new types of intelligence never before required (AFP 14-210, 1998: 83). In addition, it will take a collaborative effort of operations, intelligence, and technical communities to identify what recurring information is truly needed to conduct IO actions (AFP 14-210, 1998: 83). Collecting EVERYTHING is expensive, time consuming, and wasteful. Focusing collection efforts, however, requires specific goals, methods, and objectives.

The next piece of the IW puzzle is knowledge of our own weapons capabilities. The IW Weaponeering and Force Application phase of the proposed process can be separated into weapon characteristics, level of effort, measures of effectiveness, and effects assessment indicators. Although the details of the action's deployment will be driven by the specific situation and theatre characteristics and can only be determined at the time of action deployment, there is a level of commonality that can and *must* be identified to aid planners, targeteers, intelligence collectors, and assessment analyst. This proposed next step is an attempt to capture this level of commonality. Table A- 1 below summaries the three main knowledge requirements identified earlier in this appendix.

Table A- 1.Summary of Knowledge Requirements

IW Battlespace Characteristics	
	Information Increase info needed for awareness Increase age of info Increase error content Decrease completeness of info Information Systems Reduce Bandwidth Reduce Throughput Increase error induced by system Decrease completeness induced by system Increase recovery rate Defeat physical hardness Defeat security measures and processes Defeat detection system Information Based Processes Increase consumption of essential resources Increase consumption of essential time Reduce timeliness of process Reduce accuracy of process Reduce focus of process Reduce Resilience of process
Adversary's Characteristics	
	Vulnerabilities Threat Capabilities Normal Intel Relationships IO specific relationships Information Decision Characteristics
IW Weapon Characteristics	
	Capabilities What can it affect and how?
	Method of Delivery Method Platform Payload
	Limitations and Weaknesses What can it affect and how? Countermeasures?
	Info needed to deploy
	Effects Assessment Indicators (EAIs) Weapon Method Mission

A.2 The Proposed Next Step

In order to do a better job of identifying and acquiring the knowledge needed to use offensive IW actions effectively, all three knowledge areas must be improved. The proposed process presented attempts to improve and create a

common view of the IW battlespace, which can serve as a starting point across the community. This will also help in the collection efforts of our adversary's characteristics.

The next few paragraphs is the proposed next step to improving our knowledge of offensive IW weapon/action capabilities. The approach will also aid in identifying recurring and specific intelligence collection requirements.

The goal of the next step is to take the initial results and to create a "living' repository of offensive actions and weapon capabilities (at a categorical level). This could then be used at the operational level of operations as a starting point to further decompose the information realm (IW Battlespace) and to arrive at specific and area of interest target aimpoint nominations. The process/procedure uses brainstorming to identify possible actions to attack or affect the information realm and incorporates the concepts within the IW Weaponeering and Force Application Phase of the proposed IO planning process. Figure A- 1 represents Phase II—IW Weaponeering and Force Application.

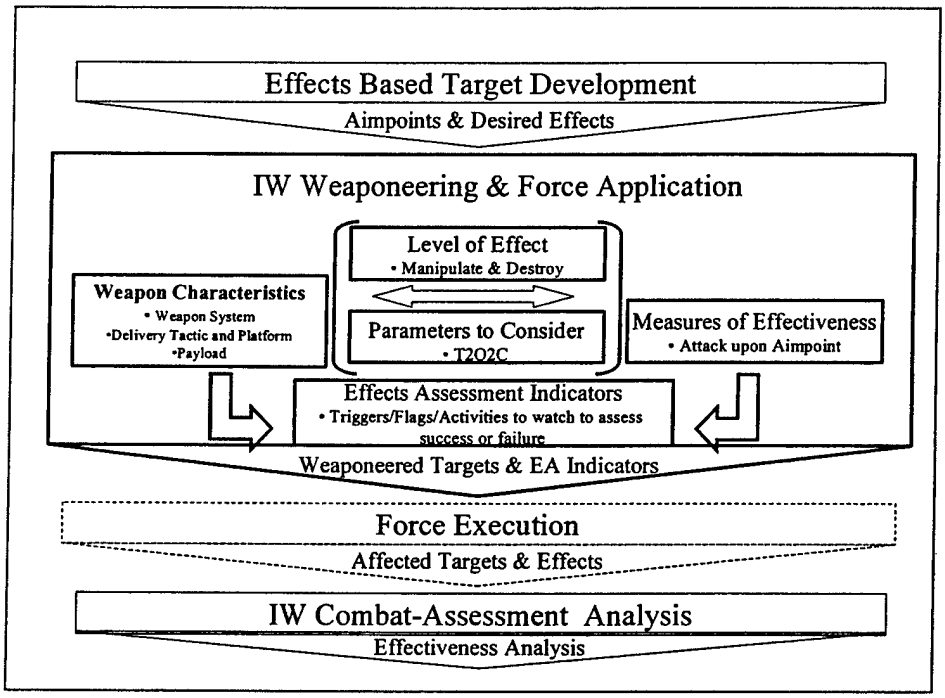


Figure A- 1.Phase I—IW Weaponeering & Force Application

The brainstorming session is made up of a variety of subject matter experts. The suggested procedure uses the information realm and associated effect points as its IW battlespace baseline. Measures of effectiveness and weapon characteristics are the essential building blocks in identifying delivery methods, platform, payload, and effects assessment indicators.

The session can be broken down into two distinct steps. It is important to note that these sessions are focused upon the IW Battlespace's target sets and effect points as presented within this research. Therefore, the inputs into Phase II—IW Weaponeering and Force Application are the target and desired effects. Although, this phase can be used for both traditional kinetic weapon systems, it is used in the session to identifying IW weapon actions. The two steps are summarized in Table A- 2 below.

Table A- 2. Summary of Steps of Brainstorming Session

Phase 1—Weapon/Action Characteristics Identification	
Identify methods	How can we affect (devalue) this effect point of the IW Battlespace?
Identify level of effort	Which D (deny, disrupt, degrade, destroy) applies with the specific method?
Identify the possible payloads for each method	What will be required to damage or affect the target?
Identify the possible platforms to be used for each method	What will be required to get the payload to the desired target?
Note: Time, timing, quality, quantity, and costs are applied and determined at the time of deployment of the action.	
Phase 2—Effects Assessment Indicator Identification	
Identify triggers, flags, or events that are focused on method, platform, or payload success or failure	What would be possible indicators/triggers that could tell us if the weapon characteristics (method, platform, or payload) SUCCEEDED as planned? What would be possible indicators/triggers that could tell us if the weapon characteristics (method, platform, or payload) FAILED as planned?
Identify triggers, flags, or events that are focused on the characteristics of the measures of effectiveness	What would be possible indicators/triggers that could tell us if we SUCCEEDED at affecting the correct attribute or effect point? What would be possible indicators/triggers that could tell us if we FAILED at affecting the correct attribute or effect point?

Once the weapon characteristics are identified, as outlined in the above table, appropriate effects assessment indicators (EAIs) are identified for each weapon action. Once weapon capabilities and actions are identified several other areas become possible. Some of the benefits are listed in Table A- 3.

Table A- 3. Benefits of Identifying Weapon Characteristics

Improved Understanding of Action/Weapon Modification and Development Possibilities and Requirements	
	Method Variations
	Payload Variations
	Platform Variations
Improved Understanding and Identification of Information, Intel Collection, and Action Deployment Requirements	
	Recurring (common across the battlespace)
	Specific (to the AOI or circumstance)
Improved Understanding and Identification of Information Assurance Posture Requirements	
	Offensive Action Possibilities
	Countermeasure Action Requirements
	Defensive Action Requirements(Policies and Procedures)
	Infrastructure Requirements (Software, Hardware, Configuration)
	Manpower Requirements (Attacker and Defender)

In addition to the above benefits, a repository of weapon capabilities/actions and their possible EAIs can be identified and passed on to all IO planners to be used and improved upon during both deliberate and crisis action planning phases. The identification of the possible weapon capabilities/actions can possibly ensure a baseline of knowledge and help creative thinking to *begin* at a broader and higher level.

A.3 Informal Studies

In order to test and refine the procedures of this next step, several studies were performed during the course of this research. The purpose of these studies was twofold. The first purpose was an attempt to verify that the concepts used in the developed process could be applied across the IO environment. These concepts are weapon methods, delivery platform, payload, and effects

assessment indicators (EAIs). The second was to identify a procedure or exercise that would begin to further decompose the offensive objective hierarchy (target sets and effect points) in systematic and simple way that could possibly be used in the day-to-day operations of an IO Planner. In addition, the information identified would then be used to populate a repository of common actions for each effect point within the battlespace. The hypothesis was, "that the IW battlespace was comprised of a level of commonality where decomposition could take place and a better understanding of the types of offensive actions could be realized".

A.4 An Initial and Subjective Analysis

Several groups were asked to participate in the informal studies. Two of the sessions analyzed the same IW Battlespace attribute, bandwidth. In support of the hypothesis, both groups tended to identify similar types of actions. The results of both groups are listed in Table A- 4 below.

Table A- 4. Results of Sessions

Effect Point: Reduce Bandwidth	
Group 1—AFIT IW Students	Group 2—AFIWC Members
Reconfigure Equipment	Reconfigure HW
Destroy Links	Affect Comm Nodes
Distributed DOS	Distributed DOS
Send Virus	Virus
Increase Traffic	Electronic Jamming
Note: Items are not prioritized or in any specific order	

A.5 Conclusion

The main objective of this appendix is to introduce a procedure that will aid in decomposing the IW Battlespace and acquiring a better knowledge of

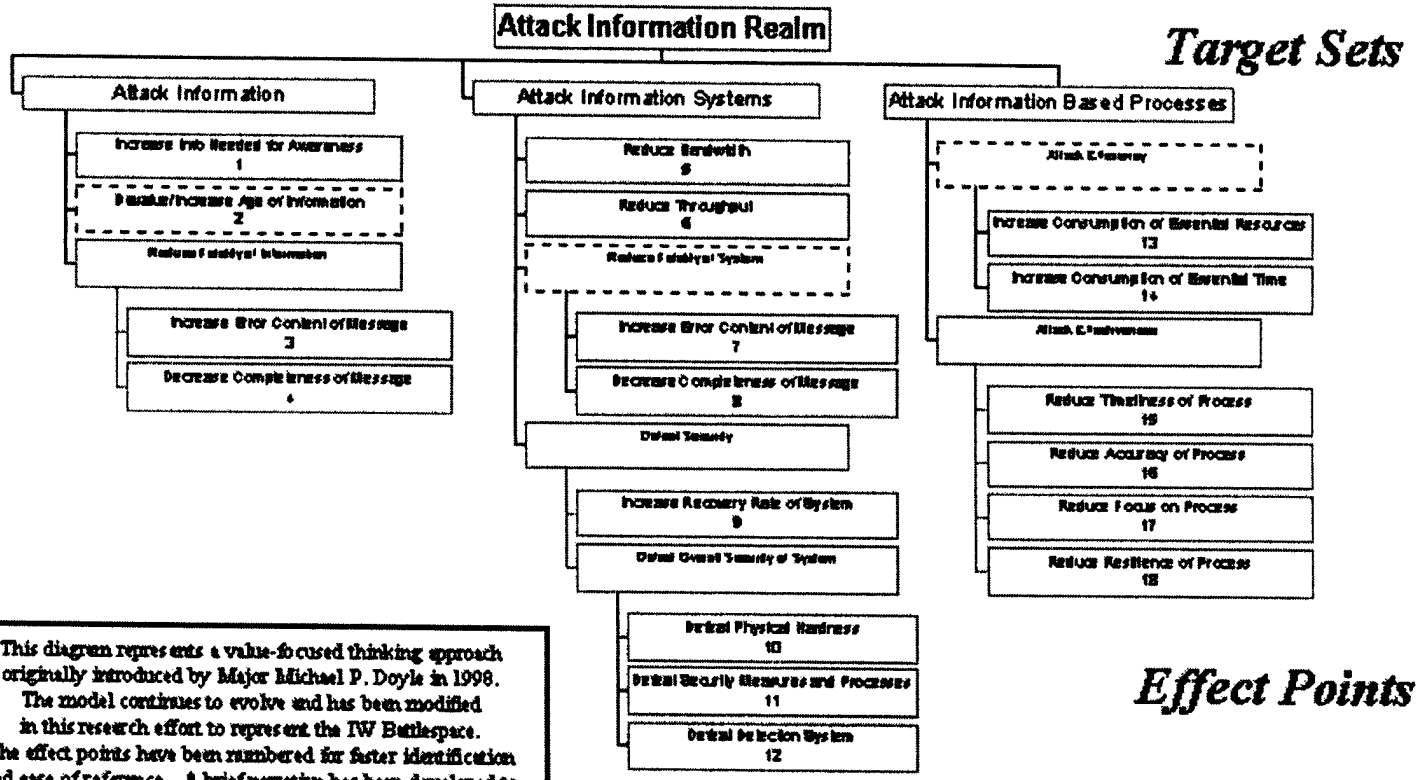
offensive IW actions. It incorporates some of the concepts identified during the course of the research; effect points, weapon characteristics, and effects assessment indicators.

B Appendix—IW Battlespace

The purpose of this appendix is to consolidate all products pertaining to the Offensive IW Battlespace. The IW Battlespace and Costs diagrams are included in "full" size in this appendix for easier reference and viewing. In addition, two other products are included to accompany these diagrams and act as quick reference (crib) sheets. The first is a narrative, which attempts to list the different aspects of the IW Battlespace in a consolidated format. The second item is the Measures of Effectiveness Table. This is also meant to be a quick reference item to be used as needed or more specifically within the exercise or brainstorming sessions.

IW Battlespace

Target Sets and Effect Points

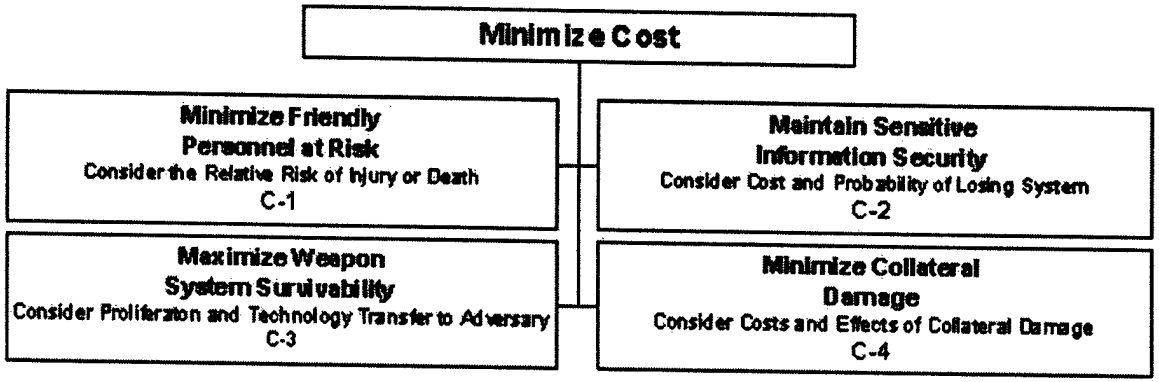


This diagram represents a value-focused thinking approach originally introduced by Major Michael P. Doyle in 1998. The model continues to evolve and has been modified in this research effort to represent the IW Battlespace. The effect points have been numbered for faster identification and ease of reference. A brief narrative has been developed to accompany this diagram as a quick reference to definitions and other pertinent information.

Original Source: Capt Michael P. Doyle
AFIT Thesis, 1998--Modified

IW Battlespace

The associated costs of deploying a weapon



This diagram accompanies the IW Battlespace—
Target Sets and Effect Points.
These costs have been numbered for faster identification and ease of reference. These costs are also included in the quick reference narrative of definitions and other pertinent information.

Original Source: Capt Michael P. Doyle
AFIT Thesis, 1998

Offensive IW Battlespace—Target Sets and Efffect Points Goals, Definitions, Actions, Effects, and Measures

This product is meant to compliment both the IW Battlespace—Target Sets and Effect Point and Cost diagrams. It is a quick reference guide that attempts to list the different aspects of the IW Battlespace in a consolidated format.

The offensive objectives presented here were first introduced as the Value Hierarchy for the Information Realm and the Objectives Hierarchy for Offensive Information Operations and created by Capt Michael P. Doyle as part of his thesis research in 1998. Incorporation of these hierarchies into this research proved beneficial, but also required several modifications. This appendix represents the modified version. One major modification was the incorporation of the overall goals of Information Operations as described below.

The reference is set up in the following format.

1. Overall goals of Information Operations — **Underlined and Bolded**
   - 1a. Strategic goals
   - 1b. Operational and Tactical Goals
   - 1c. Definition
   - 1d. Offensive IO Objective (OIO) Actions — **Bolded**
2. Information component (Target Set) — **Underlined and Bolded**
   - 2a. Definition
3. Information subcomponent — Underlined
   - 3a. Definition
4. Information component attributes (Effect Points) — **Numbered and Bolded**
   - 4a. Definition
   - 4b. Affected by:
   - 4c: Offensive IO Objective (OIO)
   - 4d. Possible Level of Effect of OIO Action
   - 4e. Desired Effect
   - 4f. Measurement

Overall Goals of Information Operations

The goal of strategic level Information Operations is to influence the hearts and minds of our adversaries by affecting the decision maker and his or her decision making process.

The goal of operational and tactical level of Information Operations is to affect information factors to induce a desired decision to achieve a desired effect. This is done by manipulation and destruction of the information realm in order to induce a decision of the adversary that benefits friendly forces.

OIO Actions: **Control the Potential Effect** –3 alternatives

Cause to Reject Truth—when the adversary is presented with the truth—rejects the truth—likely to accept the false

Effect: Causes the adversary to doubt true information

Cause to Accept False—when the adversary is presented with the false—accepts the false—likely to reject the truth

Effect: Causes the adversary to accept the false reality

Cause to Accept Truth/Reject False—Sees reality clearly—lifts fog in a believable way

Effect: Leads the adversary to the correct decision

Measurement: Level of expected effect on decision
Probability/Category: High, medium, low probability or no change

Information—Data and its semantic meaning that conveys the intended message. It has no mass, physical form, and causes no action

(1) Information Needed for Awareness—the minimum amount of information to update an existing body of knowledge in a manner that either changes the current picture or reduces uncertainty of the current picture. The value of info is linked to the amount of info required to update the decision maker's current understanding or picture of the decision environment.

Affected by: Amount and quality of info already held (body of knowledge)
Amount and quality of the new info received

OIO Objective: Increase Information Needed for Awareness

OIO Action: Manipulate & destroy information needed

Desired Effect: Force adversary to need an increasing amount of information in order to maintain the same level of awareness.

Measurement: Level of support required to maintain awareness level.
Category: Maintenance Level (Hardware), System Operator Level (System Software), User/self fix Level (User Apps), no change or effect to updates

(2) Age of Information—Timeliness (age) provides value to the decision making process. The subject of the information will drive the amount of time required between updates in order to maintain its value. Info is devalued as time passes.

Affected by: The number of time cycles increase, information value is reduced by the increasing uncertainty of the battlespace.

OIO Objective: Devalue/Increase Age of Information (As time passes, the value of the information is reduced with respect to decision making—increasing decision maker's uncertainty about the battlespace)

OIO Action: Manipulate and destroy updates to information

Desired Effect: Reduce the timeliness of new or existing information to the adversary.

Measurement: Number of change cycles since update.
Quantity: 0 – 5 cycle times (Information more than 5 change cycles old is no longer valuable.)

Fidelity—ability to convey, stores, and manipulate complete information without adding or allowing error to be added (information integrity). The components of the fidelity are error content and message completeness.

(3) Error Content—The amount of aggregate errors in the relayed message

Affected by: Information manipulation or destruction

OIO Objective: Increase Error Content of Message

OIO Action: Manipulate & destroy content of message

Desired Effects: Prevent the correct message/information from being received.

Measurement: Percentage of error content in message
Percentage: 0 to 100%

(4) Completeness of Message—Ability to convey a complete message

Affected by: Information manipulation and destruction

OIO Objective: Decrease Completeness of Message

OIO Action: Manipulate & destroy completeness of message

Desired Effect: Prevent a complete message from being received

Measurement: Relative amount of meaning retained
Category: No meaning, major degrade, minor degrade, no change

Information Systems—Any physical component that conveys, stores, or processes information without adding value to the decision making process. It provides physical form and sets it to motion

(5) Bandwidth—The amount of information that can traverse simultaneously.

Affected by: Amount of necessary bandwidth available

OIO Objective: Reduce Bandwidth

OIO Action: Manipulate & destroy available/relative bandwidth

Desired Effect: Affect the relative amount of bandwidth necessary for continued operations.

Measurement: Relative level of bandwidth available
Category: Stopping/preventing, greatly reducing, moderately reducing, no change.

(6) Throughput—The amount of signal that a system can send in a given amount of time.

Affected by: Amount of signal that a system can send in a given amount of time.

OIO Objective: Reduce Throughput

OIO Action: Manipulate & destroy available throughput

Desired Effect: Affect the amount of throughput available

Measurement: Relative level of throughput available
Category: Stopping, greatly reducing, moderately reducing, no change.

Fidelity—ability to convey, stores, and manipulate complete information without system error being added. The components of the fidelity are error content and message completeness.

(7) Error Content—The amount of aggregate errors in the relayed message

Affected by: System induced (transmission or reception) error

OIO Objective: Increase Error Content

OIO Action: Manipulate & destroy system induced message error

Desired Effect: Disable the receiver to discriminate the message properly.

Measurement: Percentage of error content on system
Percentage: 0 to 100%

(8) Completeness of Message—Ability to convey a complete message independent of system errors

Affected by: Induced and system noise

OIO Objective: Decrease Completeness of Message

OIO Action: Manipulate & destroy completeness of message

Desired Effect: Prevent a complete message from being received.

Measurement: Relative amount of meaning retained
Category: No meaning, major degrade, minor degrade, no change

Defeat Security—The level of security the system provides to the decision maker both in secure capability and intrusion detection. It is based on how hard it is to physically penetrate the system, how quickly it can recover from a degraded state, how difficulty encountered when attempting to physically penetrate it.

(9) Recovery Rate (How long to recover)—The amount of time that is required for a system to recover from a degraded condition (virtual hardness)

Affected by: The ability for the system to return to full operating capacity.

OIO Objective: Increase recovery time

OIO Action: Manipulate & destroy recovery time of system

Desired Effect: To increase the amount of time it takes for system to be recovered.

Measurement: Number of change cycles over which system is unable to perform mission. The number of adversary's missed decision cycle.
Quantity: 0 – 5 cycles (Any out of service time greater than 5 change cycles offer no more value to the attacker)

Defeat Overall Security Capability—The non-physical protection (security measures and processes) of a system.

(10) Effort to penetrate physical hardness—The level of difficulty associated with overcoming the physical protection of the system. This could include physical, active, and passive defenses.

Affected by: Difficulty to penetrate hardness of system

OIO Objective: Penetrate physical security of system

OIO Action: Manipulate & destroy physical hardness of system

Desired Effect: To physically degrade, disrupt, or destroy a system.

Measurement: Level of defeat affected
Category: Completely defeat, moderately defeat, slightly defeat, no change (no capability)

(11) Security Measures and Processes (Classification)—The ability to communicate without revealing the message content to unauthorized elements.

Affected by: Compromises to the non-physical security measures and processes

OIO Objective: Defeat security measures and processes

OIO Action: Manipulate & destroy security measures and processes of system

Desired Effect: To overcome security measures and processes (encryption, firewalls, classification levels, etc)

Measurement: Likelihood of gaining access to system
Probability/category: High probability, moderate probability, low probability, and no change

(12) Intrusion Detection—The ability to detect, locate, and report intrusion to the system.

Affected by: Ability to by-pass intrusion detection systems

OIO Objective: Defeat detection system

OIO Action: Manipulate & destroy detection system

Desired Effect: Penetrate the system with the desired detection effect.

Measurement: Expected ability to defeat the adversary's intrusion detection methods with desired effect.
Category: Low, medium, high, and certain effect.

Information-Based Processes—Any element that adds value to information and decision making process.

Efficiency—The proper utilization of resources; personnel, equipment, software, other related materiel, and the amount of processing time of specific information

(13) Essential Resources Consumed—The consumption of essential and required resources of a process.

Affected by: Resources allotted to a process or diverted from others

OIO Objective: Increase Consumption of Essential Resources

OIO Action: Manipulate & destroy availability of essential resources

Desired Effect: Increase the level of resources consumed by having items destroyed, replaced, disrupted, or supplemented. Consider finite resources that can be diverted from other processes

Measurement: Consumption of Essential Resources
Percentage: 0 to 100%

(14) Essential Time Consumed— The consumption of essential and required time of a process.

Affected by: Relative value of time consumed at the expense of other processes

OIO Objective: Increase Consumption of Essential Time

OIO Action: Manipulate & destroy availability of essential time required

Desired Effect: Increase the amount of time an adversary must allocate to a process to maintain a given level of support—relative time consumed

Measurement: Consumption of essential time
Percentage: 0 to 100%

Effectiveness—Information must support decision making in real time or must reduce long-term uncertainty about the battlespace

(15) Timeliness—The availability of value-added products and information when needed.

Affected by: Ability to provide products in a timely manner

OIO Objective: Reduce timeliness of process

OIO Action: Manipulate & destroy availability of essential time

Desired Effect: Affect the receipt of the information, degrading or rendering information useless for the decision at hand.

Measurement: Number of change cycles that the processed product is late
Quantity: 0 to 3 decision cycles (Product or info loses all value after 3 cycles)

(16) Accuracy—Information must be integrated and fused properly into an accurate product that is reliable and enhances decision-making.

Affected by: Degrading accuracy of tools and products used in decision-making

OIO Objective: Reduce accuracy of process

OIO Action: Manipulate & destroy accuracy of process

Desired Effect: Decrease accuracy of products from normal operating standards, degrading correct and consistent analysis

Measurement: Degradation to process accuracy
Percentage: Degradation (0 to 100%)

(17) Focus—The ability to direct a course of action in a desired direction or accomplishment of a specific task.

Affected by: Ability to actively direct a desired course or direction

OIO Objective: Reduce Focus on Process

OIO Action: Manipulate & destroy focus of process

Desired Effect: Direct the process away from its intended use or towards the desired direction

Measurement: Expected ability to redirect process
Category: Completely redirect, moderately degraded, slightly degraded, no change

(18) Resilience—The ability of the process to adapt to unexpected occurrences and still provide value to the decision maker and decision making process

Affected by: Susceptibility to failure or degradation

OIO Objective: Reduce Resilience of process

OIO Action: Manipulate & destroy adaptability of process

Desired Effect: Force adversary to change tools/processes/leadership affecting the ability to adapt and recover.

Measurement: Expected ability to reduce adaptability or recovery of process
Category: Catastrophic failure, moderately degraded, slightly degraded, no change

Cost Objectives (values 0 to 100%)

(C-1) Friendly personnel at risk—The cost of losing or injuring friendly personnel

Affected by: Exposure to injury or death

OIO Objective: Minimize Friendly Personnel at Risk

Desired Effect: Minimize the relative risk of friendly personnel being injured or killed

Measurement: Relative Level of Risk
Percentage: 0 – 100% zero risk to high risk
Slight risk: Losses not expected
Moderate risk: Losses are expected
High risk: Losses are certain

(C-2) Sensitive Info at risk—The cost of exposure of sensitive info or technology—information/methods. Once exposed it will be available for others to use.

Affected by: Exposure to adversary's intelligence gathering

OIO Objective: Maintain sensitive information security

Desired Effect: Keep sensitive information or technology from exposure, which could lead to usage by adversary

Measurement: Expected level of proliferation
Percentage: 0 – 100% (Probability of proliferation)

(C-3) Weapon system survivability—The ability for the system to survive the mission. There are one-way systems, which survive if they reach the target, and reusable systems if they can be recovered from the mission.

Affected by: System characteristics and ability to recover

OIO Objective: Maximize system survivability

Desired Effect: Plan for required actions to recover appropriate/applicable systems

Measurement: Expected probability of survival
Probability: 0 to 100% (linear increments)

(C-4) Collateral Damage—The secondary damage while striking a target. It includes, but not limited to the untended loss of allied personnel, noncombatants, destruction of cultural or sanctuaries and other places of cultural significance.

Affected by: Untended effects or damage

OIO Objective: Minimize Collateral Damage

Desired Effect: Minimize the effects of collateral damage from chosen offensive action.

Measurement: Expected level of collateral damage (percentage of damage)
Percentage: 0 – 100%

Offensive IW Battlespace—Target Effect Points

Measures of Effectiveness

	Defined Objective	Offensive Action*	Measurement Unit	Measurement Type	Lower Bound	Upper Bound
1	Increase amount of Information needed for awareness	Manipulate & destroy information needed	Level of support required to maintain awareness level	Category	User-level	Maintenance Level
2	Increase Age of Information	Manipulate & destroy updates	Number of change cycles since update	Quantity	0	5
3*	Increase Error Content of Message	Manipulate & destroy content of message	Relative amount of meaning retained	Category	No Change	No Meaning Retained
4*	Decrease Completeness of Message	Manipulate & destroy completeness of message	Percentage of Error Content	Percentage	0	100
5	Reduce Bandwidth	Manipulate & destroy available bandwidth	Relative Level of Bandwidth available	Category	No Change	Deny Flow
6	Reduce Throughput	Manipulate & destroy available throughput	Relative Level of Throughput available	Category	No Change	Stop Flow
7	Increase Error Content Imposed by System	Manipulate & destroy content of message corrected by system	Percentage of Error Content	Percentage	0	100
8	Decrease Completeness of Message Imposed by System	Manipulate & destroy completeness of message corrected by system	Relative amount of meaning retained	Category	No Change	No Meaning Retained
9	Increase Recovery Time	Manipulate & destroy recovery time of system	Change Cycles over which the System is unable to perform	Quantity	0	5
10	Penetrate Physical System	Manipulate & destroy physical hardness of system	Level of Defeat effected	Category	No Capability	Completely Defeated
11	Defeat Security Measures and Processes	Manipulate & destroy measures and processes	Likelihood of gaining access to system	Probability	No Change	High Probability
12*	Defeat Detection System	Manipulate & destroy detection system	Expected Ability to Defeat Adversary's Intrusion Detection	Category	Certainty of Desired Effect	Low Likelihood of Desired Effect
13	Increase Consumption of Essential Resources	Manipulate & destroy essential resources	Percentage of Essential Resources Consumed	Percentage	0	100
14	Increase Consumption of Essential Time	Manipulate & destroy essential time required	Percentage of Essential Time Consumed	Percentage	0	100
15	Reduce Timeliness of Process	Manipulate & destroy change cycles	Number of change cycles that the processed product is late	Quantity	0	3
16	Reduce Accuracy of Process	Manipulate & destroy accuracy of process	Percentage of Degradation to Process' Accuracy	Percentage	0	100
17	Reduce Focus on Process	Manipulate & destroy focus of process	Expected Ability to Redirect Process	Category	No Change	Completely Redirected
18	Reduce Resilience of Process	Manipulate & destroy adaptability and recovery of process	Expected Ability to Reduce Process Adaptability and Recovery	Category	No Change	Complete Failure

Source: Capt Michael P. Doyle
AFIT Thesis, 1998—Modified to accompany IW Battlespace

Offensive IW Battlespace—Target Effect Points

Measures of Effectiveness—Costs Objectives

	Defined Objective	Offensive Action*	Measurement Unit	Measurement Type	Lower Bound	Upper Bound
C1	Minimize Risk to Friendly Personnel		Relative Level of Risk	Percentage	0	100
C2	Minimize Sensitive Information Security		Expected Level of Proliferation	Percentage	0	100
C3	Minimize Weapon System Survivability		Expected Probability of Survival	Probability	0	1
C4	Minimize Collateral Damage		Expected Level of Collateral Damage	Percentage	0	100

Source: Capt Michael P. Doyle
AFIT Thesis, 1998

C Appendix—Research Instruments

This appendix is included as a repository of all of the research instruments used to request, present, or collect data. This appendix is made up of three different "packages" of instruments; presentation assessment, senior level assessment, and research extension exercise. The following paragraphs will briefly describe the purpose of the packages and how each package was used.

C.1 Presentation Assessment

The purpose of the presentation-briefing package is a vehicle to help acquire face validity of the concepts and process developed by those participants that may not be willing to read through the actual report. The first document is the research request sheet. This sheet is used to communicate the research objective, time required to present, the benefits, and the importance of the research. The second item in the package is the briefing that was presented to all participants. This is a powerpoint presentation that is used to communicate the background, the research intent, the concepts, the process, and future research. It contains some key points within the note pages. The third item is the data collection document used for individual feedback of presentation participants. The objective of this was to solicit the participant's opinion on the usefulness of the concepts and process.

C.2 Senior Level

Although the appendix only holds the senior level critique form, the senior level package consist of a report outlining the background, the concepts, the process, and the next step for future research. The report used in this review resembles Chapter 4 of this thesis. The purpose of this package was to be able to forward the report with a critique form to senior and mid-level IO managers for their viewpoint and suggestions.

C.3 Research Extension Exercise

The exercise package is similar to the presentation package, but is used for the "future" research called the next step (Appendix A). The purpose of the exercise is to identify IW weapon capabilities using the concepts presented in the research through the use of semi-structure brainstorming.

An exercise research objective sheet was included in this package as well. It was also used to communication the exercise's objectives, time required of its participants, benefits to the participant, and the importance of this research. In addition, the package consisted of an exercise briefing, which was used to visually present the concepts and definitions used within the exercise. The exercise narrative complimented and worked hand-in-hand with the briefing. The exercise narrative was a script or guide for the briefing and brainstorming session. The last document in this package was the exercise critique. Similar to the presentation critique, it's objective was to assess the usefulness, the usability, and the improvement recommendations from the individual participant.

Presentation Assessment Research Objectives: Acquire face validity of the developed process and derived concepts.

This will be done by presenting the definitions, concepts, and process in a briefing to subject matter experts currently assigned to an IW Flight. A one-page critique sheet will be used as a mechanism to assess the face validity of the usability and usefulness of the definitions, concepts, and process.

Time Required: 1-1 ½ hours. The presentation should take approximately 45-60 minutes. Filling out the one page critique should take approximately 5-10 minutes.

Benefits of the Experiment to you

1. Exposure to an offensive IW-focused planning model.
2. Exposure to the development of weapon characteristics and applicable EAIs.

Why is this research important?

This research will attempt to fill voids that exist in the implementation of IO/IW within the Air Force. There are three important missing links; dimensions of the infosphere affecting the decisions of an organization, a focus on the primary goal of offensive IW at the tactical level of operations, and IW weapon knowledge, that are not accounted for in any doctrine or operational concept.

Currently, written guidance given to IO planners is focused on the state of the adversary and influencing the decision maker and his/her process. Although, these are very important pieces of the battlespace (know your enemy), proactively matching/modifying/building IW weapons and strength capabilities to exploit vulnerabilities of the adversary is the other very important piece of the battlespace that is not explicitly addressed or discussed.

In order to build a stage for this type of knowledge to evolve, this research has identified the other two essential pieces; dimensions or the environment of IW and a definition of the primary goal of Offensive IW at the tactical level of operations. In addition, a process is proposed to help to further identify the required components within the Air Force environment.

Several documents that guide IO development within the Air Force outline several concepts or requirements that this research may play a role in accomplishing.

Joint Vision 2020

1. It attempts to develop *compatible processes and procedures*
2. It leverages the *advantage* of a systematic and *new capability* model
3. Weapon knowledge necessary to exploit adversary's weaknesses

AF IO Concept of Operations

1. This helps to *implement IO at the operational level*
2. It provides a good use of the *"total" battlespace* by matching our weapon "strengths" to the adversary's weaknesses.

Concept of Operations for Effects Based Operations (Draft)

1. Focus is placed on the *"effects" of an action* by attempting to identify applicable and appropriate MOEs and EAIs
2. IO weapon characteristics will combine *commander's intent/objectives, assessment indicators, and assessment feedback loop*

**Italicized items are concepts and requirements presented within the applicable document*

After- Presentation Feedback Form

PART 1
For each question, mark the box with an "X" that most closely matches your opinion.

1. Does the process seem easy to use?

Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree

2. Does the process seem useful for identifying different types of actions to be taken?

Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree

PART 2—What part of the presentation would you use in the future?
Place a circle around (or a line of Xs next to) the **"bolded"** areas that you *would* use and write down any changes, additions, or modifications in the space provided below each concept.

a. Process
If circled, what changes/additions/modifications would you make to improve it?

b. Concepts

1. IW as a Primary Weapon Option

2. Primary Goal of Offensive IW (Tactical Level): Affect the Info Factors

3. IW Battlespace: Target Set and Effect Points

4. Assessment Analysis: Effects Assessment Indicators (EAIs)

If circled, what changes/additions/modifications would you make to improve it?

c. Other, please add any not identified above.
How would you incorporate your input into the current process?

PART 3—What part of the presentation would you NOT use in the future?
Place a circle around those you would NOT use and write down any changes, additions, or modifications to the area in order for you to use it.

a. Process

If circled, what changes/additions/modifications could be made that would enable you to use it?

b. Concepts

1. IW as a Primary Weapon Option

2. Primary Goal of Offensive IW (Tactical Level): Affect the Info Factors

3. IW Battlespace: Target Set and Effect Points

4. Assessment Analysis: Effects Assessment Indicators (EAIs)

If circled, what changes/additions/modifications could be made that would enable you to use it?

Senior Level Feedback Form

PART 1

For each question, mark the box with an "X" that most closely matches your opinion. Use the space below each answer for any comments you may have.

1. What is your opinion of the PROCESS presented in the research?

Strongly Disapprove	Disapprove	No opinion	Approve	Strongly Approve

2. What is your opinion of the CONCEPTS presented in the research?

IW as a Primary Weapon Option

Strongly Disapprove	Disapprove	No opinion	Approve	Strongly Approve

Primary Goal of Offensive IW (Tactical Level): Affect the Info Factors

Strongly Disapprove	Disapprove	No opinion	Approve	Strongly Approve

IW Battlespace: Target Set and Effect Points

Strongly Disapprove	Disapprove	No opinion	Approve	Strongly Approve

Assessment Analysis: Effects Assessment Indicators (EAIs)

Strongly Disapprove	Disapprove	No opinion	Approve	Strongly Approve

PART 2—What part of the research do you see as useful to the IO community?

Place a circle around (or a line of Xs next to) the "**bolded**" areas that you *would* use and write down any changes, additions, or modifications in the space provided below each concept.

a. Process

If circled, what changes/additions/modifications would you make to improve it?

b. Concepts

1. IW as a Primary Weapon Option

2. Primary Goal of Offensive IW (Tactical Level): Affect the Info Factors

3. IW Battlespace: Target Set and Effect Points

4. Assessment Analysis: Effects Assessment Indicators (EAIs)

If circled, what changes/additions/modifications would you make to improve it?

c. Other, please add any not identified above.

How would you incorporate your input into the current process?

PART 3—What part of the research do you see as NOT useful to the IO community?

Place a circle around (or a line of Xs next to) those you would NOT use and write down any changes, additions, or modifications to the area in order for you to use it.

a. Process

If circled, what changes/additions/modifications could be made that would enable you to use it?

b. Concepts

1. IW as a Primary Weapon Option

2. Primary Goal of Offensive IW (Tactical Level): Affect the Info Factors

3. IW Battlespace: Target Set and Effect Points

4. Assessment Analysis: Effects Assessment Indicators (EAIs)

If circled, what changes/additions/modifications could be made that would enable you to use it?

PART 4—General Comments

Research Extension Objectives: Validate the concepts of the IW Weaponeering and Force Application Phase of the proposed IO Planning Process.

This will be done by using the definitions and concepts of the proposed process through a structured brainstorm session in order to identify IO weapon characteristics and applicable Effects Assessment Indicators (EAIs)

Time Required: 2-2 ½ hours. Administrative information and a brief background will take approximately 10-15 minutes. The rest of the time is allotted for the brainstorming session.

Benefits of the Experiment to you

1. Exposure to a comprehensive planning model and procedures on how to employ it.
2. Exposure to the development of weapon characteristics and applicable EAIs.

Why is this research important?

This research will attempt to fill voids that exist in the implementation of IO/IW at the tactical level. There are two important missing links in today's environment; new dimensions of the infosphere affecting the decision making process and IW weapon knowledge, that are not accounted for in any doctrine or operational concept.

Currently, guidance given to IO planners is focused on the state of the adversary. Although, this is a very important piece of the battlespace (know your enemy), proactively matching/modifying/building IW weapons and strength capabilities to exploit vulnerabilities of the adversary is the other very important piece of the battlespace that is not explicitly addressed or discussed.

Several documents that guide IO development within the Air Force outline several concepts or requirements that this research may play a role in accomplishing.

Joint Vision 2020

4. It attempts to develop *compatible processes and procedures*
5. It leverages the *advantage* of a systematic and *new capability* model
6. Weapon knowledge necessary to exploit adversary's weaknesses

AF IO Concept of Operations

3. This helps to *implement IO at the operational level*
4. It provides a good use of the *"total" battlespace* by matching our weapon "strengths" to the adversary's weaknesses.

Concept of Operations for Effects Based Operations (Draft)

3. Focus is placed on the *"effects" of an action* by attempting to identify applicable and appropriate MOEs and EAIs
4. IO weapon characteristics will combine *commander's intent/objectives, assessment indicators, and assessment feedback loop*

**Italicized items are concepts and requirements presented within the applicable document*

Exercise Weapon Characteristic and EAI Development
Research Extension--Jan 2001

Introduction--Good Afternoon/Morning
Thank you for volunteering your time in this experiment.

Slide –Agenda
Overview
Expectations
Brainstorm Session
After-Session Critique

Slide --Exercise Objectives
Validate Systematic Approach to action characteristics

You are being asked to participate in a step-by-step and systematic approach in order to validate a process for identifying how the information, information systems, and information based processes can be affected, more specifically, how information can be devalued.

Slide --Exercise Focus

Effects based
Limited to Single Actions
Computer Network Attack (CNA)
Perfect Information Flow

This is very important to remember because following a specific process is essential, therefore, there may be times, the approach we will be taking may not be very exciting and may be very obvious...there is a reason for it. Please bear with me and keep notes of your suggestions and concerns. Your notes can also be used for the after-session critiques/feedback

Slide --Expectations
You:

1. Keep an open mind and don't be afraid of being different
2. Keep the appropriate definitions in mind at all times
3. Keep your experiment "NOTE SHEET" handy to jot down things you feel can be done better or in a more appropriate order of presentation. Of course, comments in general would also be appreciated.
4. Ask questions if you do not understand!

Facilitator:

1. Keep the group on track and to follow the step-by-step approach

2. Answer questions with the best of my ability!

The facilitator will be taking you through a series of brainstorming sessions.

All you'll have to do is sit back and participate by thinking outside the box -- remember your input/concept could trigger some other angle we never thought about.

Slide –Forms

Before we get started, I'd like to quickly go over the forms and diagrams you have in front of you. These will be available to you throughout the exercise.

1. Offensive IO Objective Model
2. Offensive IO Attribute and IO Action Definitions
3. Measures of Effectiveness Table
4. Note Taker

This ends the administrative related items, but before we get into the actual brainstorming session, I would like to first give you a quick overview of some of the key concepts that will be used in the exercise.

Slide –Quick Overview

Please be assured that they will be presented AGAIN, within the session, so please do not feel pressured to having to commit them to memory.

Slide --Information Breakdown—Hierarchy
HANDOUT

We will be looking at the Information Realm and more specifically, how we can devalue the attributes of this environment. More specifically we will be looking at least, at one of the attributes from one of the main components of Information, Information Systems, Information Based Processes

HIDDEN-Slides --Information Environment

Information

Information systems

Information based processes

Slide –Definitions

Actions/Weapon Characteristics Definitions
Tactics

The "How to" of the action or the weapon system in order to effect the aimpoint as desired.

Platform

The equipment or system used to transport the product or action to the intended target

Payload
The active agent or damage (effect) mechanism that "effects" the target.

Levels of Effect
Manipulate
Deny-Not allow temporarily
Detour-Deviate from a direct route or course of action
Delay-Put off to a later time, slow or cause to be late
Degrade-Lower in quality
Disrupt-Disturb or interrupt

Destroy-Wreck, ruin, kill, demolish

Assessment Indicators
Triggers/flags/activities that could signify success or failure

Weapon—The effectiveness of the weapon's or action's effect to the intended information component and aimpoint.

Method—The effectiveness of the tactics, platform, payload of the weapon or action chosen.

Mission—The effectiveness of the action's effect on the decision made.

The Brainstorm Session

Possible Reference Sheet:

Information Realm
1. Given Items: Attribute and Weapon

a. We will be working on one specific attribute of one of the components at a time.
The first one we will look at is under the component "Information Systems" and the attribute of "Reduce Bandwidth".
Facilitator: Use this sequence for each attribute. Bandwidth is used as an example.

b. The pillar of IO that we will be using is Computer Network Attack (CNA).

2. Goal 1: Identity the weapon (CNA) characteristics that affect the information component of "information systems" thru the use of devaluing or reducing the attribute of "bandwidth".

NOTE:

1. You may have to note "other characteristics" or have participants use their note takers so no inputs are lost due to timing.
2. The sequence of identifying platforms and payloads may be intertwined...use the above caution, but don't squelch creativity.

SEQUENCE—Weapon Characteristics

a. First lets identify those methods or tactics that will "reduce bandwidth"

Goal: Continue til suggestions cease or drift to other attributes or gets too detailed.

Facilitator: At end and before proceeding group/consolidate "like" items together to shorten list, if possible.

b. Now that we've listed methods of reducing bandwidth and consolidated like items, lets look at each one individually and identify the type of platform needed to deliver the action to the target.

Goal: Continue til suggestions cease or drift to other attributes

Facilitator: Identify a platform for each action, in most cases, the type of platform may be repeated and limited to just a couple of choices.

c. Now that we've listed the methods and platforms, we now have to identify the payload for each item.

Goal: Continue til suggestions cease or drift to other attributes

Facilitator: Identify all possible payloads to be used with each method and platform. Again, you may see a lot of repetition, but continue and treat each "package" individually.

d. For each package, determine if the package can be used at each level of effect. For example; For this tactic, delivered with this platform, employing this payload...answer the following questions: Can it deny bandwidth? Can it degrade bandwidth? Can it disrupt bandwidth? Can it destroy bandwidth?

Note: Most times, all "Ds" will be possible, but there has been times where not ALL Ds could be satisfied due to either the platform or payload being used. Be careful, not to breeze thru this!

SEQUENCE—Assessment Indicators

a. For each "package" (one tactic, one platform, one payload) determine applicable assessment indicators.

   Identify at least ONE assessment indicator for each type of assessment type (weapon/action and method—MISSION WILL NOT BE IDENTIFIED)

Note: Sequence is not important. The important item here is identifying at least one for each type. Use trigger "phrases" to prompt thought to the different types of indicators.

b. Weapon/Action Effectiveness: For each attribute ask the question; Did the action devalue what we wanted it to attack; ie. bandwidth of an information system?

   Indicators: What would be possible indicators/triggers that could tell us if we devalued the correct attribute or component?

   Note: Use of the appropriate MOE could/should identify items that could tell us success or failure of the method.

c. Method Effectiveness: For each method ask the question; Did the method use tactic/payload/platform achieve the desired affect?

   Indicators: What would be the possible indicators/triggers that could tell us if we had the appropriate effect due to this action?

   Note: Use of the appropriate MOE could/should identify items that could tell us success or failure of the method.

Wrap UP

I would like to thank you for your time and I would appreciate any comments you may have.

You are welcome to take any handouts you have used during this session.

The only item I ask that you leave behind are your note takers. Again, thank you for your time. I there are any questions or additional comments, I will be here after this session.

After-Exercise Critique
Brainstorm Session

PART 1

For each question, mark the box with an "X" that most closely matches your opinion.

1. Is the process **easy to use**?

Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree

2. Is the process **useful** for identifying possible actions to be taken?

Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree

3. Does the process help to **identify actions** that have the desired effect upon the Information Realm?

   For example: If the desired effect is to reduce bandwidth, does the process lead you to actions that will "reduce bandwidth"?

Strongly Disagree	Disagree	No opinion	Agree	Strongly Agree

PART 2—What part of the exercise would you use in the future?

Place a circle around or a line of XXXs next to the **"bolded"** areas that you *would* use and write down any changes, additions, or modifications in the space provided below each concept.

a. Process

If circled, what changes/additions/modifications would you make to improve it?

b. Brainstorming Session

If circled, what changes/additions/modifications would you make to improve it?

c. Concepts

1. IW as a Primary Weapon Option

2. Primary Goal of Offensive IW (Tactical Level): Affect the Info Factors

3. **IW Battlespace**: Target Set and Effect Points

4. **Assessment Analysis:** Effects Assessment Indicators (EAIs)

If circled, what changes/additions/modifications would you make to improve it?

d. **IW Battlespace**

If circled, what changes/additions/modifications would you make to improve it?

e. Other, please add any not identified above.

How would you incorporate your input into the current process?

PART 3—What part of the exercise would you NOT use in the future?

Place a circle around or a line of XXXXs next to those you would NOT use and write down any changes, additions, or modifications to the area in order for you to use it.

a. **Process**

If circled, what changes/additions/modifications could be made that would enable you to use it?

b. Brainstorming Session

If circled, what changes/additions/modifications could be made that would enable you to use it?

c. Concepts

1. **IW as a Primary Weapon Option**

2. **Primary Goal of Offensive IW (Tactical Level):** Affect the Info Factors

3. **IW Battlespace:** Target Set and Effect Points

4. **Assessment Analysis:** Effects Assessment Indicators (EAIs)

If circled, what changes/additions/modifications could be made that would enable you to use it?

d. IW Battlespace

If circled, what changes/additions/modifications could be made that would enable you to use it?

Comments:

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14. ABSTRACT

Consistently and comprehensively using Information Operations (IO) capabilities as a primary weapon option within the Air Force is the next step to operationalizing IO within the Air Force. Doctrine and official guidance has set the variables of mission and concepts of operations, organizational structure, and IW players in place. The missing variable to operationalizing IO and probably the most difficult is the "how" or process of the equation. This research will introduce a useable process that can be incorporated within the Air Force for integrating offensive IW activities into the current and given environment. The process is the basis for further decomposition and identification of target aim points. In addition, it's use of effect points should aid in focusing long-range, deliberate, and crisis action planning on the possible desired effects on an adversary. The research sets the stage by briefly defining the first three variables; organization, mission, and players in which AF IW is practiced and the inherent deliverables required. It will then introduce a view and decomposition of the information battlespace as the basis for offensive IW activities where affecting the information factors in order to induce a desired decision to achieve desired effects is the overall goal.

15. SUBJECT TERMS

Information Operations, Information Warfare, Offensive Component of Information Warfare, Primary Weapon Option

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